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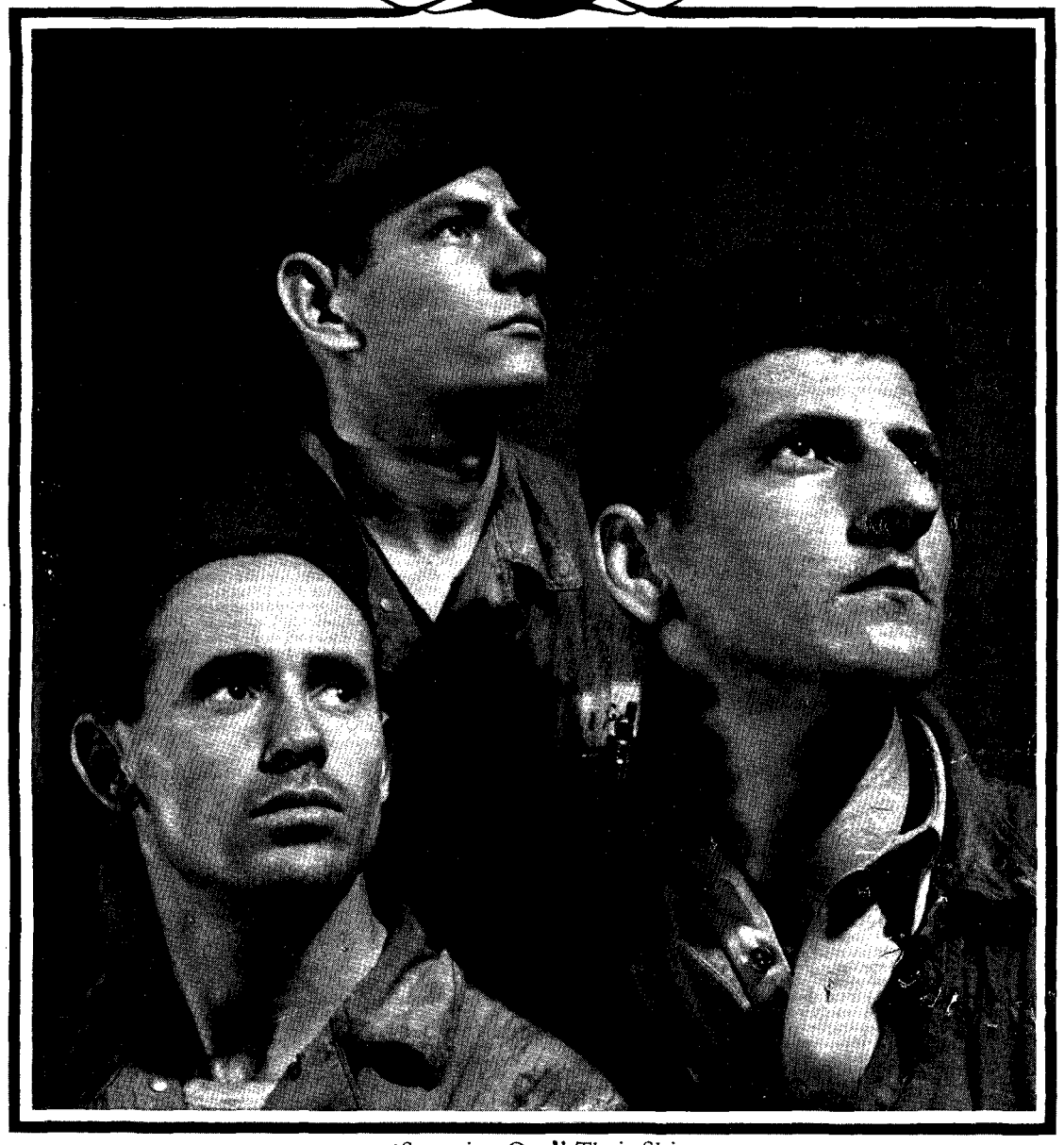

"Sweating Out" Their Ship

JANUARY 1943

Vol. 26 No. 1

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AIR FORCE

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January Brief

This Month Air Force introduces a new department, On the Line (Pages 20 and 21), which will appear each month in the interest of better maintenance of Air Forces equipment. The maintenance mistakes featured in this new department may appear more humorous than helpful at first glance. But, as one of the crew chiefs who helped set up the picture put it: "Say—I'm kidding, but in earnest. These mistakes happen every day." You'll see what he means.

The Front Cover Picture and the picture on the inside back cover are the work of Private Roger Coster, Air Force staff photographer.

Rated among the top photographers of Europe before the war, Private Coster served 18 months with the French Infantry and saw 45 days' action against the Germans on the western front.

Released from the French army on a medical discharge, Private Coster returned to his home in Paris, only to leave again, just 24 hours before the German army entered the city.

Private Coster landed in New York City in April, 1941, after photographing his way through Portugal, later Brazil. He entered the United States Army on September 22, 1942.

Major General Ralph Royce whose article on air operations in the Southwest Pacific appears on Page 15, commanded the Northeast Air Area in Australia before taking up his present duty as Commanding General of the Southeast Army Air Forces Training Center, with headquarters at Maxwell Field, Alabama.

Last April, from Australia, General Royce led a flight of three B-17s and ten B-25s on a 4,000-mile bombing raid on shipping, airfields and other Jap-held points in the Philippines.

With Aircraft approaching the speed of sound, the technical but highly fascinating subject of compressibility becomes more and more important, particularly to the boys who fly the high speed equipment. This month's Air Force introduces compressibility and its basic principles in an article by Colonel Ben S. Kelsey, now working on special projects for the Chief of the Production Division, Wright Field, Ohio. Two succeeding articles will take up the effect of compressibility on aircraft operations and its relationship to aviation engineering and design.

Captain Harold R. Hansen who takes you along on an Army acceptance flight of a B-17 in his article on Page 29 had his first real urge to take to the air in 1926. Private flights cost about $20 each in those days so he kept his money in his pocket and enlisted in the National Guard Air Corps. He not only got his plane ride but has been flying ever since, is now Army Production Engineering Officer (and chief Army test pilot) at the Boeing Aircraft Company's plant at Seattle.

When Called to active duty from the Air Corps Reserve last March, Captain Jon A. Laird was flying DC-3s over the New York-Miami run for Eastern Air Lines. In the Air Forces he continued to fly DC-3s but they were converted for cargo service and he was flying them "over the hump" across the Burma Road in ferrying supplies from India to China. His experience while on that assignment form the basis for the article on Page 31.

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CROSS COUNTRY

IN the Army you "sweat out" everything from chow lines to promotions.

That is, you worry it through until you get some kind of answer, whether it be food or another stripe.

When maintenance men of the Air Forces sweat out their ship, what occurs is something you can't write into Tech Orders no matter how hard you try.

Sweating out is more than just searching the sky for your plane. It is having the personal interest in a machine and the concern for its crew that goes beyond duty and beyond orders.

All over the globe our ground men are weating internally, you might say, for the uccessful mission and safe return of the lanes they work on.

The three mechs on the cover are actually (left to right) Sergeant Hugh D. Smith, Staff Sergeant James E. Williams and Technical Sergeant James H. Gardner, all attached to a medium bombardment squadron at Mitchel Field, N. Y.

But we might have picked at random any three maintenance men out of many thousands in the Air Forces and put them in that picture. For ground crews are the same the world over. And they are sweating out a lot of planes into fighting shape in a lot of theaters, and here at home as well, despite weather and the enemy and spread-out supply lines.

At the moment, for instance, headlines feature the North African scrap. But headlines seldom, if ever, tell about the fight going on in the desert theater to keep aluminum and steel and wood and rubber in flyable shape at all times.

The headlines don't tell about the talcfine sand that sometimes gets as high as 9,000 feet in the air, about how every time an engine turns over it draws through its intake an abrasive that eats into pistons, bearings, gears and every mechanical part as effectively as emery dust. Or how sandstorms present additional problems; in fact, each time a squadron takes off from a desert field it does so in a sandstorm—one created by the prop wash.

And sand is only one headache for the maintenance men in North Africa. Extreme changes in temperature make it tougher. (Weather conditions in the North African theater are described in detail on Page 11.) Many plane parts, good for 500 hours under normal conditions, are often good for only 50 hours because of the North African climate.

Our best engineers have studied the North African situation to the last lock-nut and as a result many ingenious devices have been adopted to solve the maintenance problems over there. But the real answer lies with ground crews themselves, with the guys who have their own private battle to fight and their own sweating out to do so the main show can go on.

AND speaking of maintenance in North Africa, our damaged planes are being carried off the field of combat in the desert area almost as carefully as are our soldiers. The reason is a huge salvage trailer now being employed to transport damaged planes in the desert.

The trailer bears the name "Queen Mary." With it a damaged plane can be transported from the point where it has been forced down to the nearest place where repairs can be made. The damaged plane can thus be dis-assembled, its component parts carefully wrapped to avoid further damage enroute, and the plane can be carried bodily off the field in such a way that it will be ready for combat again in the least possible time.

Crews of the mobile repair units which include the Queen Mary's are picked men. They have to be. They must be able to work rapidly and efficiently under cover of darkness, must be able to defend themselves as best they can if attacked by enemy planes or ground troops. Most of all, they must have a high degree of ingenuity to tackle the problems that come along. For seldom are two salvage operations the same.

It's possible that before the present scrap is over in North Africa this huge salvage trailer will steal away the title "Ship of the Desert" from the camel, which has had that moniker for centuries.

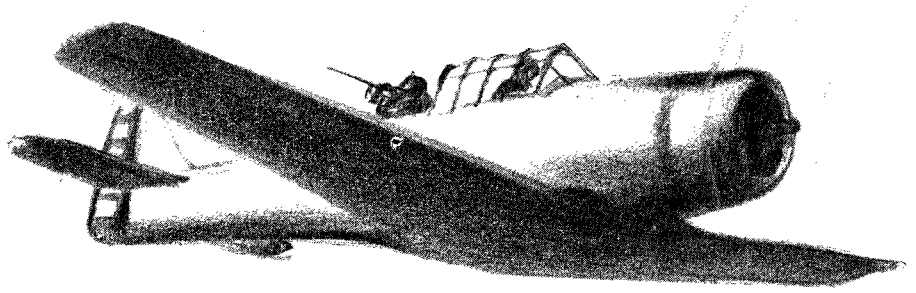
NEW courses, leading to a commissioned status, in meterology are now open to enlisted men under a program inaugurated by the Weather Service of the Air Forces for the training of high school graduates and college freshmen and sophomores to become Weather Officers.

Satisfactory high school or college work in mathematics and science, especially physics, is a prerequisite. High school students will be given a one-year pre-meterological course and college freshman and sophomores a six-months course.

The new courses are in addition to the Aviation Cadet course in meterology. Inquiry about any of these courses should be addressed to the University Meterological Committee, University of Chicago, Chicago, Illinois.

FOR the Fifty-Fourth Fighter Group:

"Happy landings. On your leaving, this Air Force joins with me in admiration for



your performance in combat after long over-water flights; for maintaining your airplanes in fighting condition with few mechanics, without a forced landing chargeable to poor maintenance; for the long and weary days of constant air alert over our farthest advanced bases; for the way you have proved that you can take punishment and inflict it on the Jap. When next you meet the enemy, we will be watching and will take pride in your brave action. With you we honor the memory of Major Wilbur Miller and the others you leave forever here. This will be published in General Orders as a permanent record of the achievement of your Group."

(The above is a paraphrase of the message sent recently to the 54th Fighter Group from the Commanding General of the air force to which the 54th had been attached. For security reasons all reference to the theater, air force and the Commanding General concerned have been deleted.—Ed.)

BOMBARDIERS have a lot of stuff to remember. You might be interested in knowing that the twelve major correctible errors which creep into bombardiering can be summed up as follows:

1. Failure to make a pre-flight check.
2. Failure to lock and unlock racks.
3. Selection of wrong target.
4. Failure to inspect bombs before take-off.
5. Failure to turn on rack switches.
6. Poor knowledge of identification of enemy submarines and surface craft.
7. Accidental release of bombs.
8. Failure to check oxygen supply and equipment.
9. Failure to turn on bombsight switches.
10. Rapid and jerky operation of correction knobs.
11. Incorrect altitude computation.
12. Entering incorrect data in bombsight.

COLONEL L. H. RODIECK, a member of General Marshall's staff, told this one after a recent tour of the South Pacific theater:

"During dinner we heard two B-17s coming in and we dashed out to meet them. Colonel Saunders (Col. Laverne G. 'Blondy' Saunders, commanding heavy bombers at an advanced base in the Solomons area) meets every one of his planes as it lands.

"He was out there when the ship stopped rolling. He was tickled to death to see them and the young pilots were tickled to death to be there. He wanted to know if they had done any good. Well, they had done some bombing, but they didn't know whether they had done any good or not. He then asked if any Zeros had attacked them. " 'Yes, but they didn't do a bit of good. About eight of them hit us, but we only got three of them.' That is very poor, they think, over there.

" 'Did they hit you at all?' he asked.

" 'No, sir. Not a hit.'

" 'Are you sure of that?'

" 'No, sir, they didn't hit us.'

"Colonel Saunders asked 'What are those holes there?' pointing just back of the bomber's door.

"About this time one of the mechanics came out. 'Oh, Colonel, you don't count *those* holes,' he said. 'Those are little bitty holes. We got those ground strafing on the way back.' "

THE Wings Club of New York City, recently given official representation and recognition by the Assistant Secretary of War for Air and the Commanding General of the Army Air Forces, is anxious that its membership should include all officers of the Air Forces. Membership may quite likely prove of benefit to our officers, particularly those visiting New York and London, England.

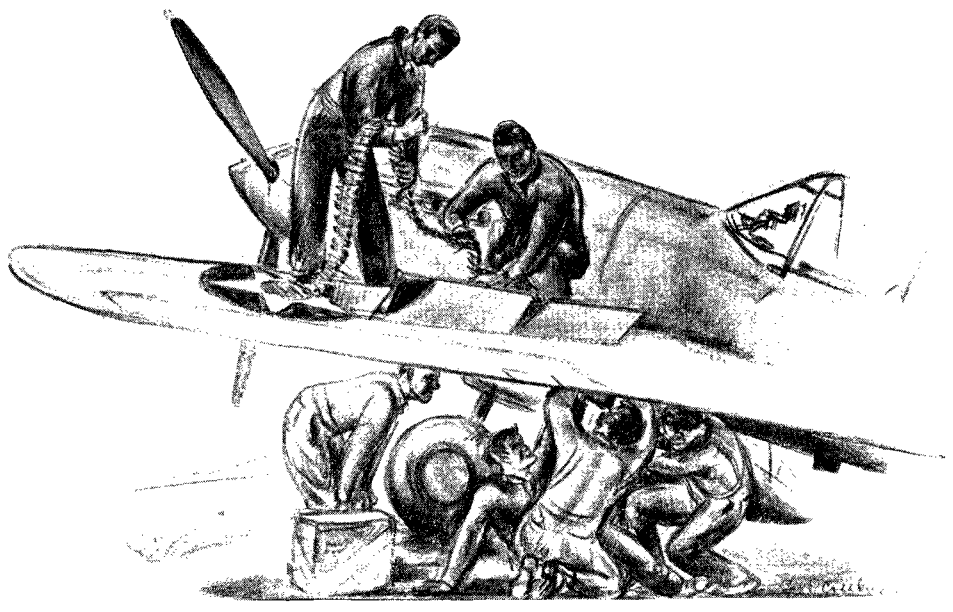
There are no initiation fees and no dues for members on active duty in the Air Forces except during periods when the clubhouse facilities are being used. Dues of $2 for any 30 consecutive days are then in effect.

The Wings Club has acquired club rooms and admissions to all the facilities of the entire 22-story Yale Club building at 50 Vanderbilt Avenue in New York. And that means the works—hotel accommodations, recreation facilities, gymnasium, theater tickets and travel service, restaurants, and all the rest. The club has a reciprocal agreement with the Royal Aero Club of London. For more information you can write the club at its New York address.

MASTER SERGEANT HARRY DARBY, sergeant major of a base tactical group at March Field, Calif., is credited with thinking furloughs are great—for the other guy. It's part of his duties to approve furloughs, but although he joined the Army 25 years ago Sergeant Darby has never had a furlough himself, and has never asked for one. We don't know about this one. We just don't know.

THREE new theater medals have been authorized for officers and men who see service outside the continental limits of the United States. They are the American, the European-African and the Asiatic-Pacific theater medals. The actual medals will not be made up until after the war but the ribbons are expected to be made available within the next few weeks.

RESPONSE to the first issue of AIR FORCE was gratifying. The value of your service journal can be enhanced in the future by your suggestions and the material you send in for publication. We appreciate the comments and correspondence already received. How about some more? Which features of the December issue did you like best—and why? Which features of this issue? Tell us the kind of articles you want and we will try to get them.—THE EDITOR.



OUR AIR FORCE

After One Year At War

By Lieut. General Henry H. Arnold

COMMANDING GENERAL, ARMY AIR FORCES

The Commanding General reports on our combat record and looks to the future

The following article contains highlights from a graduation-day address delivered by General Arnold at Randolph Field, Texas, December 13, 1942.

IN ONE YEAR the Army Air Forces has proved in combat what it can do. Hitler had seven years to build his air force. We had one year to fight and to build ours—and we had to do both simultaneously. Hitler didn't think we could do it—other people had their doubts, too—but *we did.*

We are building overwhelming air power—on schedule. Our monthly airplane production is over 4,000. Another great expansion program is under way to *double* that output.

We will need those extra planes because this is an aerial war in which one or the other of the combatants will be driven from the sky—and it won't be us. This is a grim struggle in which anything goes. There's no umpire to blow the whistle when a Jap or German clips you from behind. The only thing that counts is the score. Did you kill the enemy or did he kill you?

Did we win or did we lose? Well, the record speaks plainly enough.

From February 1, 1942, through December 5, 1942, the Army Air Forces has definitely destroyed 928 enemy planes and probably destroyed 276 in aerial combat. We have lost 130 of our own and 104 are missing. As the result of aerial fighting, the score stands 928 enemy planes knocked out as against 234 of ours.

Hence the ratio of planes lost is about *four* to *one* in our favor. Bear in mind that these figures include *all* our losses as the result of combats but only those enemy planes whose destruction has been verified.

I want you to *improve* that ratio. Get the enemy in your sights and give it to him. It's your life or his. I want you to destroy them six to one, or eight to one, or ten to one before we're through — and I believe you can do it.

After a year of war we have much to be proud of, but we have really just begun to fight. Do not underestimate our foes.

During the past year we have built airfields all over the world, in blistering deserts, in jungle forest, on top of arctic glaciers. We have trained a tremendous number of men. We have developed a world-wide system of air transport. We have dealt heavy blows against the Japanese and Italian fleets. We have carried on successful bombing offensives in all theaters of war.

Best of all, we have built up coordinated operations with our Army and Navy to an extent undreamed of heretofore.

AND as to the future, we have more to look forward to from our aeronautical research than ever before in our history. We have a "secret weapon" or two up our aerial sleeves that will deal paralyzing blows to our enemies. Our fighters and bombers are steadily increasing in range, speed, firepower and bomb loads. Entirely new aerial "battle-wagons" are on the way. We'll put on a special demonstration of them some day for Hitler and Hirohito.

In 1938 we had only 1,800 officers and 20,000 men. Today, one year after Pearl Harbor, I wish to announce for the first time that the Army Air Forces has over a million officers and men.

And we will have over two million officers and men by the end of 1943.

Our industry has also grown up. In 1940 we had in our air frame, engine and accessory plants about 233,000 employed. Today we have over 1,500,000.

The world has never seen a team like today's Army Air Forces before. We all work together, but we are expected to have "first" teams in combat on eight different fronts. That is a job which would slow up Notre Dame even with Knute Rockne at the helm. We have to do it and—with complete cooperation and help from all sides—we are doing it. Who are the members of our fighting teams, what kind of men are they?

They are not just pilots, navigators or bombardiers. They are not just weathermen, armorers or engineers.

On this great fighting team are the workers in the aviation factories—the men and women with the rivet guns.

On this team is the instructor at a flying school who would a thousand times rather knock down Japs, but who follows orders, and sticks on the job.

On this team is the civilian aircraft spotter on his lonely watch.

On this team is the tail gunner in a Flying Fort.

On this team is the aviation mechanic. He's the most important man of all, although you seldom see his name in the headlines.

The mechanics are the guardian angels of this whole flying business—they are the hidden air heroes.

Now as to the war itself.

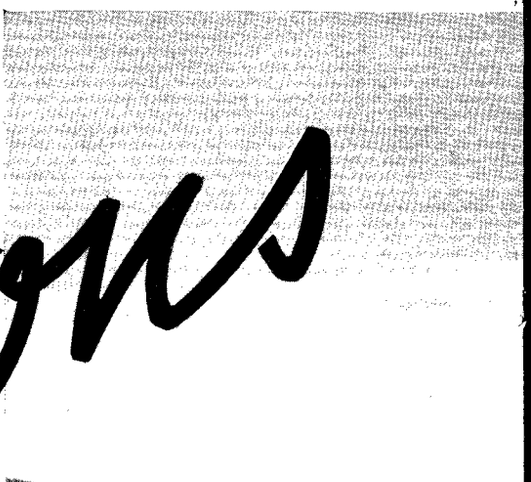
Neither the Germans nor the Japanese have come out of their combats with our Air Force without having to stop for breath —and lick their wounds. The terrific destruction wrought by the Flying Fortresses upon the best fighters that Goering could bring to bear against them came as a distinct surprise. These trained German fighter pilots tried every technique that they could conjure but the results have always been the same.

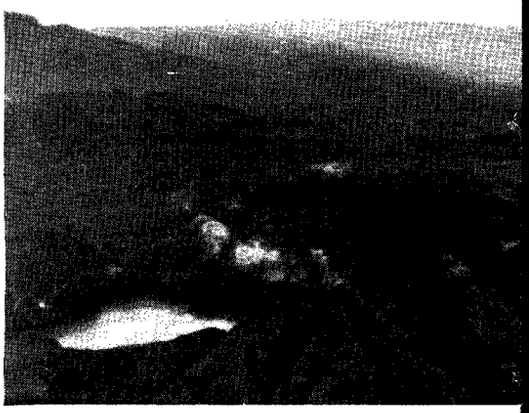
To date we have had over 1,063 different sorties against the Germans and have lost up to November 30 a total of 32 planes. That total is for losses by both aircraft and anti-aircraft. During those sorties we have definitely destroyed *(Continued on Page 35)*

AIR FORCES ACTION IN THE Solomons

By Lieut. Hulbert Burroughs

HICKAM FIELD, HAWAII





THE B-17s rolled down the Henderson Field runway early that October morning, on their way to drop a few eggs on a Jap air base at Buka and an enemy shipping concentration at Shortland Harbor. The targets were located at opposite ends of Bougainville Island.

The Zero base at Buka was visited first, and from 12,000 feet the B-17s laid a beautiful pattern of 1,000-pounders right down the middle of the runway. Five Zeros moved in to attack but they were turned back in short order.

The B-17s then turned south to Shortland and found 38 Jap ships, including battleships, cruisers and destroyers, not to mention troop and cargo transports, all gathered together for a nice bombing. The ack-ack was heavy as hell. But from about 11,000 the bombers made their runs and scored direct hits on a cruiser and a transport.

Ten Zeros came up to intercept. Two were shot down. Three B-17s collected a few routine perforations. Another was hit by a 20 mm shell that failed to explode. One of the navigators was killed by a stray 7.7 Zero bullet. A radio operator was hit in the ankle.

The B-17s turned for home. They arrived off shore near Henderson Field just as a flight of 25 Jap bombers was pounding the runway. It was easy to see that the B-17s couldn't land on the pock-marked strip, so they began circling high above the area to await developments. From their grandstand seat the B-17 boys saw quite a show.

U. S. warships near the island filled the sky with heavy anti-aircraft fire. Long condensation streamers curled high in the sky as Marine Grumman fighters dived on the attackers. American landing boats in the process of unloading troop reinforcements cut the water with their white wakes as they chugged rapidly away from their mother ships.

Exploding Jap bombs kicked up huge clouds of dust and smoke on Henderson Field. Finally the bombers were driven off.

The B-17s flew low over the field but the runway had been hit twice. In a moment, however, Marine construction crews swarmed about like ants repairing the strip. Nearby a Navy dive bomber, which had been hit on the ground, sent up clouds of black smoke. Other bomb craters dotted the adjacent area.

For two hours the B-17s circled. Then, when the Marines had finished their job, the bombers landed. And just in time to get right in the middle of a repeat performance of the show they had witnessed from the air.

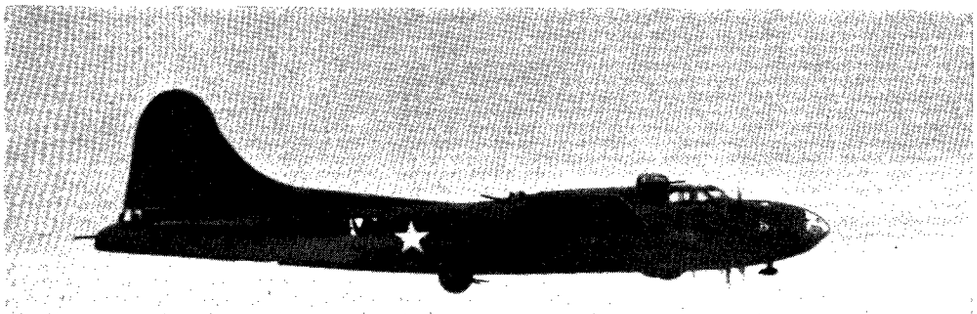
Within 15 minutes another wave of Jap twin-engined bombers were spotted heading toward the field. For most of the Air Force fliers, the receiving end of a bombardment was a new position. A similarly new experience was their wild scramble for Marine foxholes.

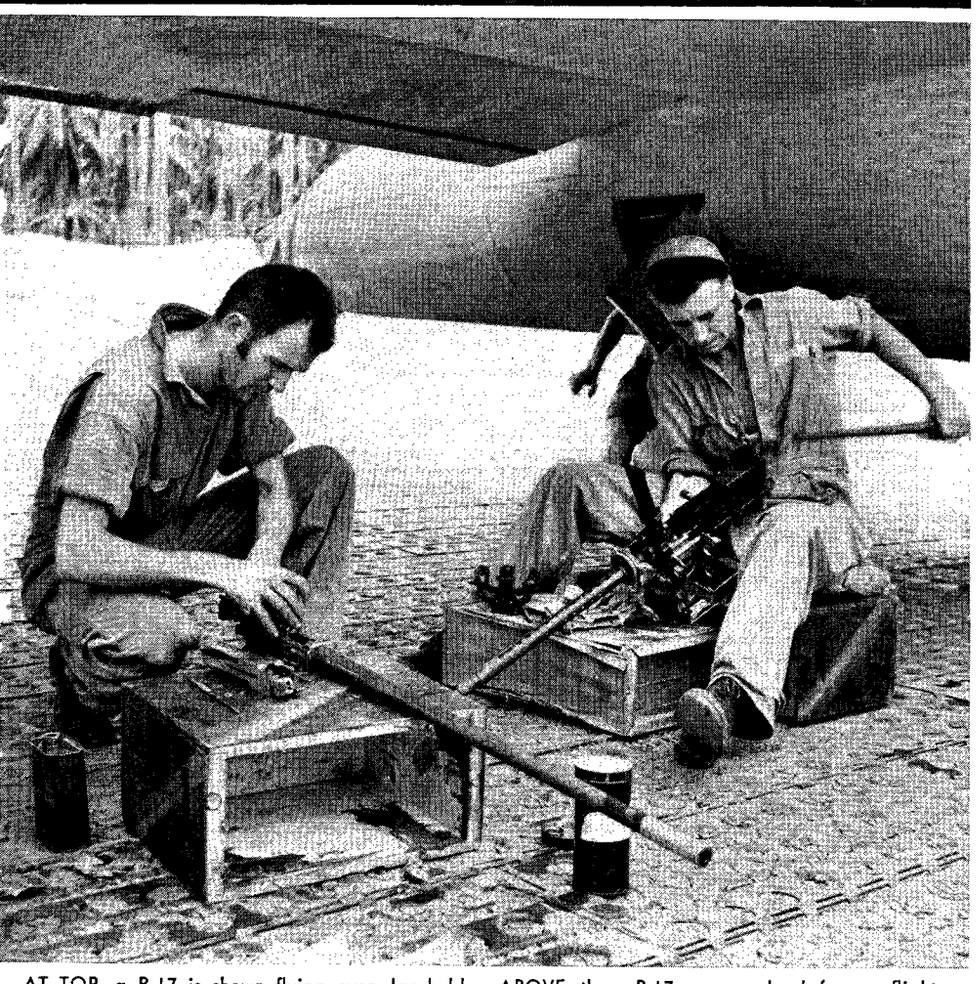
The 20 Jap bombers, flying at 20,000 feet in their usual V formation, dropped their bombs. Three hit the runway, one failing to explode. One B-17 was hit but only slight damage resulted. Most of the other bombs fell wide. Again the indefatigable Marines scrambled onto the runway and, with shovels and crowbars, trucks and rollers, repaired the damage.

By evening of that day the men were ready for a bite to eat and a night's sleep. But that's a little out of routine for Henderson Field.

At 6:30 p. m. a battery of Jap guns from

Sgt. William E. Rembt, Long Island, N. Y., holds a 20 mm. Jap shell which hit his B-17 but failed to explode during a battle with ten Zeros. Below, Pvt. Rudolph Lander, Farwell, Minn., proprietor of a PX in the South Pacific, conducts "business at usual" with Pfc. Oscar Viitanen, Ft. Bragg, Calif.





AT TOP, a B-17 is shown flying over Jap-held Bougainville Island in the northern Solomons after taking part in a raid on Buka airfield at the north end of Bougainville. Note the active volcano and the crater lake.

ABOVE, these B-17 gunners, back from a flight with the Japs, clean their machine guns at a base somewhere in the South Pacific. At left is T/Sgt. Edward T. Spetch, of Seymour, Conn., and at right is Sgt. Vernon Nelson, of Fergus Falls, Minn.

It's wild fighting and rough living on Guadalcanal for our bomb crews who give the Japs their daily pounding.

the hills to the west began shelling the field. Five-inch projectiles whistled intermittently for an hour and a half. Red tracers from Marine coastal batteries rocketed back into the hills in reply. All was quiet at 9 o'clock and some of the men turned in for the night. They were optimistic.

Two hours later, the Jap land batteries opened up again. At 1:30 in the morning a Jap plane, probably a cruiser catapult type, dropped a flare behind the field and in a few seconds a 16-inch shell from a Jap battleship exploded overhead.

Then for two hours enemy battleships, cruisers and destroyers shelled Henderson Field and Marine emplacements with five, six, eight and sixteen-inch projectiles. Some Air Force personnel sought protection in open foxholes; others crowded into covered dugouts. Throughout the rest of the night many lay on their bellies on the ground behind logs or in bomb craters.

One Jap shell exploded near a dugout in which six Air Force men were lying. The walls caved in and buried five of them. The sixth, Staff Sergeant Sebastian Maraschiello, of Buffalo, N. Y., extricated himself and, during the height of the shelling, managed to rescue three of the others.

At 3:30 a. m. "Maytag Charlie," an enemy plane so dubbed by the Marines because its engines sounded like a washing machine, dropped a flare just short of the runway and then laid two big bombs down the field.

Four more times before dawn enemy planes bombed the runway.

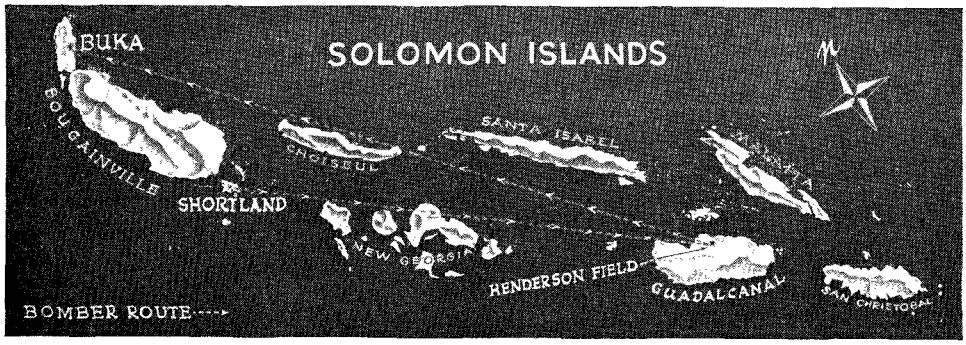
Shortly before sunrise Air Force officers inspected the runway and cleared it of shell and bomb fragments. Miraculously, only two B-17s had been hit, neither damaged badly enough to keep it from flying.

But the runway was damaged, particularly on one end. A conference was held with the B-17 pilots. Could they take the heavy bombers off the shortened runway? They agreed it was worth the try rather than have their ships go through another pasting on the ground. More Jap shells from the hills broke up the conference.

The first B-17 taxied to the end of the runway in the face of the bombardment. The pilot locked his brakes, gunned the motors to full RPM and let her go. The B-17 hurtled down the pitted runway, dodged two craters and leaped into the air just in time to miss three others. A half hour later all the planes were off the ground.

Another day had begun on Guadalcanal.

(Continued on next page)



The Japs aren't the only headaches for the men in the Solomons. There is the little matter of weather, for one thing. A "front" in the Solomons is nothing less than a cement wall.

Then on the ground in the daytime there are flies by the millions. Malaria loaded mosquitoes work the night shift and they come in similar numbers. Mosquito bars are an absolute necessity.

There are no luxuries on Guadalcanal. The men sleep in tents on canvas cots with neither pads nor sheets. Officers and enlisted men usually wash their own uniforms. A few have made deals with ex-cannibal Melanesian natives for laundry—provided the fliers supply the soap. There is no hot water, of course. No fresh meat or vegetables, no sweets, no cokes, not much mail from home. And when the mail does come to the South Seas it's usually a month or so old.

TRANSPORTATION, mostly via jeeps and 2½-tonners, is "rugged." When it rains – and the yearly rainfall is about 120 inches, most of which falls during the three month rainy season—the mud is ankle deep. When the mud dries up, the dust is ankle deep. GI shoes have at last come into their own with the Air Force officers.

Despite these hardships and discomforts a tremendous amount of work has been accomplished. One Air Force base in the New Hebrides was hacked out of a dense tropical forest and ready for use in 14 days—thanks largely to that typically American piece of heavy equipment known as the "bull dozer." On one occasion, before adequate servicing equipment was available, one crew, anxious to get into combat, filled the big gas tanks by "bucket brigade," passing five gallon "drinks" from the ground to wing.

Out in the jungle bases there is little distinction of rank either among officers or between officers and enlisted men. There is little saluting. A man is taken for what he is really worth. Between officers and enlisted men there is a feeling of mutual respect and great confidence. This is especially true in combat crews, where morale is very high.

Variety is not lacking in the missions which the B-17 crews fly day after day. Lieutenant Thomas H. Trent, of Hardinsburg, Kentucky, and his crew were out over Kapingamarangi Island (Greenwich Island) near the Carolines, when they spotted a big Jap radio schooner standing off the reef. Having no bombs and despite heavy machine-gun fire Trent dove in for an attack. For 25 minutes his gunners strafed the enemy vessel from as low as 50 feet. By the time the crew had finished its job the schooner was burning and had been beached.

Another of Trent's "routine" experiences occurred on the afternoon of October 15 when he flew to Guadalcanal with other B-17s to bomb a Jap invasion force consisting of cruisers, destroyers and transports. While making his bombing run from 11,000 feet on a troopship, four Zeros made a concerted attack upon Trent's plane.

In the first blast of fire he had his right aileron cable severed by a Jap bullet—that one-in-a-million shot. Out of control, the plane fell 3,000 feet before Trent was able to right it. Again the four Zeros came in, this time to finish off the crippled B-17. Trent's gunners shot down two of the Japs and drove the others off.

Free at last of Jap fighters, Trent faced the almost hopeless task of trying to save his crippled plane. For five long hours he alternately nursed and cursed the faltering bomber. In one stretch of rough weather the plane began to lose altitude. Trent warned his men to prepare to bail out. But again he succeeded in gaining control.

Finally they sighted their home field and were ready to try a landing. In a wide skidding turn Trent made the run for the field, found his right wing dropping too low. It refused to come up even with full left stick. Trent gunned number four engine, brought the wing up and made a perfect landing.

ON THE same flight with Trent was Lieutenant William S. Cope, Salem, Ohio, piloting another B-17. As Cope was making his bombing run on a Jap transport the anti-aircraft bursts grew thicker. Fifteen Zeros waited overhead for our bombers to clear through the ack-ack.

Cope wanted no slip-ups. Over the interphone he called to his bombardier: "Be ready to get bombs away."

In the excitement of the attack the bombardier caught only the words "bombs away." Thinking that something had gone wrong and that it was an order to dump the load, he hastily jettisoned all the bombs. A few moments later two of the cast-off bombs, falling short of the Jap transport for which they had been intended, landed squarely on the deck of a Jap heavy cruiser. Badly damaged, the ship was later sunk by Navy dive bombers.

Captain Vincent M. Crane, Manchester, Massachusetts, and his crew, spent an interesting twenty minutes over Jap-held Rekata Bay one afternoon. From a height of only 200 feet they strafed ground installations, sank two anchored sea-planes, poured 700 rounds of fire into a couple of hundred Japs scrambling around the beach, got hit by a 37 mm. shell which severed one of the control cables in the tail of their ship. By skillful maneuvering Crane made a successful forced landing at Henderson Field, tied the damaged cables together with bailing wire and made it back to his home field.

RETURNING from a tough bombing mission of Jap installations in the northern Solomons, three B-17s ran into one of those cement wall fronts. For hours they sought an opening. Lost and out of gas, they were forced down at sea. Lieutenant James Van Haur and his crew spent seven days at sea on a damaged raft. One man died at sea.

In another plane, Lieutenant Colonel Philo O. Rasmusen, Salt Lake City, Utah, was knocked unconscious by the force of the water-landing. As the ship was submerging, the co-pilot, Lieutenant Clyde Shields, of Aberdeen, South Dakota, himself suffering from a deep head wound, dragged the unconscious Rasmusen through the escape hatch and swam with him to the raft. The pilot of the third plane, Lieutenant Willard G. Woodbury, Omaha, Nebraska, and his crew were luckier. Uninjured, they reached shore in a few hours.

Lieutenant Sam B. White and his crew will have something to tell their grandchildren— if and when. On a mission over Jap territory they were jumped by fifteen Zeros. In a wild fight that lasted about twenty minutes, White's plane was badly shot up. Three hundred and fifty bullet holes riddled the ship, but the crew escaped with no injuries. Lieutenant Everett S. Turner of Binghamton, New York, was struck on the sole of his shoe by a 20 mm. shell. "It was a GI shoe," said Turner. "The bullet suffered more than I did."

On another occasion White and his men were out on a search mission. At 8,000 feet they flew into what White described as "an awfully pretty white cloud." A terrific downdraft hit the bomber and turned it upside down. Crew members rattled around in the fuselage like peas in a pod. The controls went limp. White shoved the stick forward, throttled the motors down. For terrifying seconds the plane careened wildly downward. When it finally broke out of the cloud it was in a vertical dive.

"She was indicating 340 miles an hour straight down and with the motors idling," White reported later. "We were at 2,800 feet before I could get the nose up."

The main spark-plug for such "routine" operations was tough, but affable Colonel L. G. "Blondy" Saunders, one of West Point's former all-time star football players and coach. Working long hours with quiet determination, he still found time beyond his regular duties to accompany his boys on dangerous bombing missions.

It was the Colonel and his boys who had the hectic 24 hours operating out of Henderson Field that early October morning. ☆

A pilot's own combat report of extended action against interceptors on a daylight sortie over Occupied France

By Lieut. Charles W. Paine

AT 5 A. M. on October 3, 1942, I was awakened at a Mission hut in one of our bomber stations in England. It was dark, and for a moment I didn't know quite where I was. The hut was so small that I could reach out on either side of me and touch the other officers in their beds. I wondered what I was doing awake at that hour. Then I remembered that the day before I had been assigned as pilot of a B-17 on a bombing operation over Occupied France. At the moment I didn't know the exact location of the objective, but I had been told that it was a munitions plant that was now making goods of war for the Nazis.

I dressed quickly and gulped down the tea that was brought me. After that I went to the Intelligence Office where they gave me the exact location of the objective. My navigator, Lieutenant Thompson, of St. Louis, and my bombardier, Lieutenant Komarek, of Muskegon, Michigan, were there, and I then met them for the first time. We learned that the objective was the Potez plant at Meulte, in Occupied France.

Very shortly after we got news that the operation wouldn't take off as planned, but we were to stand by. There was a good possibility that we'd get "on with it"—as the R.A.F. says—before the day was out.

We stalled around until about noon, while I got acquainted with my crew. I had never met any of them before. They had worked together, but I was a stranger to them. We were polite about the whole thing, but we wanted to know more about each other. As C. O. of a B-17 that was going to take off on an operation over enemy territory, I wanted to know more about them. They'd flown together as a crew and called each other by their first names. A good crew does that. In the air you're all out on the same party. You have to know what each member of a crew will do under any situation of the thousand and one that may come on you without warning.

But I didn't know them, so I went through the motions of inspecting the ship. I discovered her name was Phyllis. It was because of a picture on her front end. It was a picture of a swell girl, but no one in the crew could quite agree as to whose girl it was. The rear gunner, Technical Sergeant Taucher, a coal miner in normal life, said it was because "Phyllis" was *two* of the crew members' girl. That remark caused indignation among the rest, and the thing has never finally been settled. The ship, so far as I could see, was just called Phyllis because she was Phyllis.

PHYLLIS' CREW:

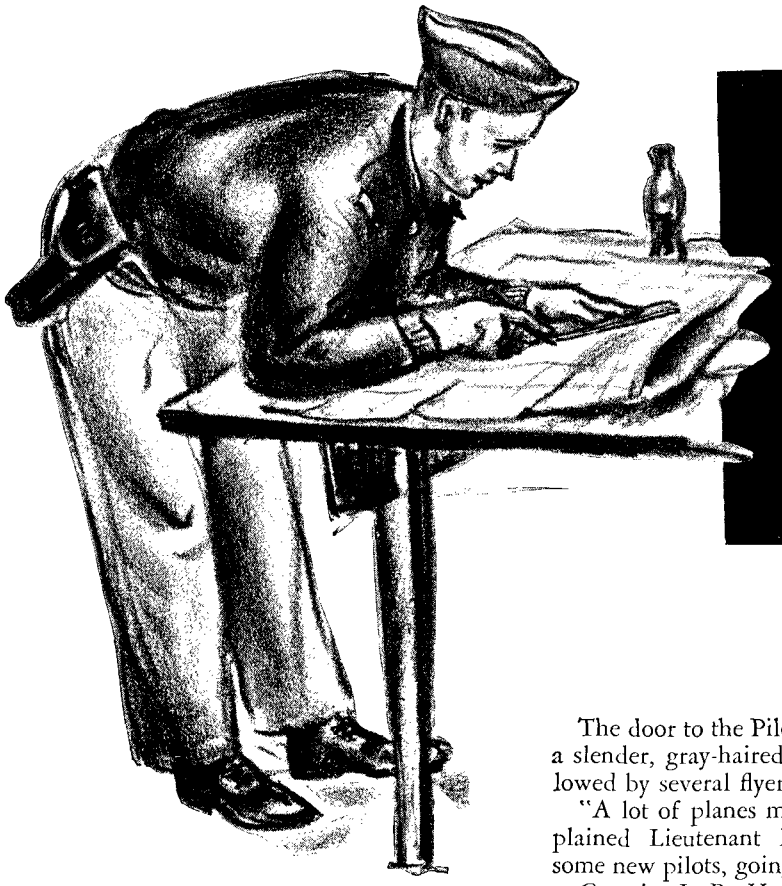
Lieut. Charles W. Paine, Pilot; Lieut. R. H. Long, Co-pilot; Lieut. S. A. Komarek, Bombardier; Lieut. John A. Thompson, navigator; T/Sgt. B. P. Taucher, Rear Gunner; T/Sgt. Ralph Sheeder, Belly Gunner; T/Sgt. A. Bouthellier, Radio Gunner; T/Sgt. Walter Parcells, Radio Operator; Sgt. Thomas Coburn*, Top Gunner, and Sgt. H. Peterson*, Waist Gunner. (*Wounded)

I went through the usual routine of checking the ship and seeing that everything aboard—including the guns—was okay. They were. I've never seen a sweeter functioning aircraft than Phyllis when we took off. She had a good crew, and I hope that I—the pilot and the captain—am in their class.

One thing I found in our favor was that two of the crew—myself and Lieutenant Long, the co-pilot—were lawyers, and that Lieutenant Komarek, the bombardier, was in his last year of law before he got in the Air Forces. Lawyers are often looked down upon, but I can only say that my co-pilot and my bombardier were damn good airmen. The rest of the boys did okay, too, in spite of being commercial artists, truck drivers, statisticians, and other assorted trades.

In the middle of the afternoon, the signal for our take-off came. As is usual at these moments, I was so scared I could hardly walk. Somehow, though, I managed to make it.

Phyllis was a long way from her home in Seattle, but she was magnificent. That was what our ground crew did for us. The guys who'd like to fly, but who take out their yearning by seeing that everything is right before the take off. *(Continued on Page 27)*



NORTH from Great Falls

By Capt. Charles D. Frazer

"THERE'S just one thing to remember on the Alaska run. That is—respect the weather. Sometimes, down in Texas, for example, you can bluff the weather and get away with it. Do that here and you're a gone goose."

We were in the Pilots' Room at headquarters of the 7th Ferrying Group, Air Transport Command.

It was mid-morning, the atmosphere was lazy and still. Several flyers, on cots or scattered chairs, were quietly smoking or reading the paper.

From a red Coca-Cola machine near the door would come an occasional thud as a ten o'clock bottle slid out. From the center of the room you could hear the click of pool balls and, from a huddled group at a corner card-table, a low voice murmuring "I'll call". Frequently, there was the chink of a silver dollar. In Great Falls, Montana, paper bills are regarded as effete. "Eastern money", they call it.

"Yep, the weather up north is always as bad as it promises to be," continued Lieutenant Hughes. "And the trouble is, you have to fly by the seat of your pants. Instrument flying is out, most of the time. Too much metal in the mountains. You get all kinds of compass variations, radio static, and I don't know what all."

Lieutenant Stenson smiled wryly and nodded his head in agreement. Both men know the Alaska run well. For months they have been beating their way up and down this tough air trail which is playing so vital a role in the war and which in peace will probably become one of the world's great airlanes.

The door to the Pilots' Room opened and a slender, gray-haired captain came in, followed by several flyers in leather jackets.

"A lot of planes moving out today," explained Lieutenant Hughes. "These are some new pilots, going to be briefed."

Captain J. P. Herron, the S-2 officer, stood at the head of a long table while the flyers seated themselves on either side. We moved our chairs over near the group and listened.

Imagination stirred at the mere names of way-stations as Captain Herron described the route from Great Falls, the true and magnetic courses, and the radio procedure all along the line. As he talked, route manuals, mileage charts, and maps were passed around among the men and carefully scanned.

Numerous unrelated pieces of advice followed.

"Check weather reports constantly. . . . Stay out of all visible precipitation, both clouds and rain. You'll be sure to get ice. . . . Be on your guard for sharp and sudden changes in temperature and winds. They're frequent. . . . Keep in mind that, usually, you can find warm air aloft. . . . When you get there, make a point to talk with the bush pilots and cargo pilots who have been flying the country for years. They can teach you a great deal."

Listening to Captain Herron, talking with men like Lieutenant L. L. Hughes, a Florida-born service pilot who has flown in many parts of the world and who was a primary instructor in the Army for a year, and Lieutenant W. A. Stenson, a Barksdale graduate who was with a tactical unit before being assigned to the Air Transport Command, you soon understand that ferrying planes to Alaska is no high tea. It's a tough grind, week in and week out. The weather is frequently unbelievable. And it gets cold—so cold that engines have to be warmed up with special heaters.

But you understand, also, that most of the pilots like the trip. The Inland Route covers new, rugged country and every mile of it is an interesting challenge to the airman.

Traffic is guided and gauged at Great Falls by the "Northern" board, a raw wood affair with row upon row of brass hooks; the board covers a good-sized wall in the operations office.

There are four vertical divisions of the board, the headings of which read: PURSUIT, 2-ENGINE, 4-ENGINE, CARGO. Each division has five columns, with subheads reading: DEPART TODAY, EN-ROUTE, DELIVERED, PILOT RETURN, PILOT AVAILABLE.

A typed card is made out for every plane to be ferried. This card describes the ship, gives its number, tells where it departed from, what the destination is, the name of the officer assigned to it, and the time of departure. There are spaces for notes regarding any service or repairs the plane may need.

Ferrying pilots or crews have to send in reports every night, in code. It is a rule of the Operations Chief, Captain O. O. Schurter, that each ship's location and condition must be transmitted; he or some other officer always remains on duty until such data is known.

As a flight progresses, the plane's card moves from column to column with all information relayed back to headquarters marked upon it. Thus, a quick glance will not only tell the particulars about any one ship but will also give a picture of the route as a whole.

This is important, for one of headquarters' principal concerns is to keep traffic flowing smoothly. Too many planes at any one station can be serious. Storage facilities are limited and, if weather closes in somewhere along the line, a depletion of gaso-

ILLUSTRATED BY
CAPT. RAYMOND CREEKMORE

line, food, and supplies at one point may clog the entire route.

Great Falls' facilities have been expanded and expanded again to fill the needs of the 7th Ferrying Group.

Gore Field itself, until a few months ago, was the city's municipal airport. It is situated three miles southwest of town on a tableland, or bench, as plateaus are called in Montana, about 500 feet high.

This bench has been given over completely to the building of an Army Air Forces base.

There are four asphalt runways. There are a few hangars, but these are chiefly working facilities, rather than storage, for part of the process of winterizing planes is accomplished by parking them in the open, where they are exposed to the snow and wind and cold that will be found to the north.

For some time, the 7th Group had its offices in the Civic Center of Great Falls. Officers lived in nearby hotels; enlisted men were encamped on the Center's indoor skating rink, with their cots ranged in the tiers of the spectator gallery. A banquet room served as kitchen and mess hall.

But now everything has moved up on the bench—to Tarpaper City. Barracks, BOQs,

Ferrying planes to Alaska from this windy Montana "bench" is a grind—and an old-fashioned challenge to the airman.

executive and operations offices, parachute room, communications and cryptographic rooms and other facilities are all of "tarpaper palace" construction, lined with insulation board and heated with stoves reminiscent of a mining camp.

FROM the control tower of Gore Field, 3,460 feet above sea level, the whole panorama of the ferrying operations spreads before you.

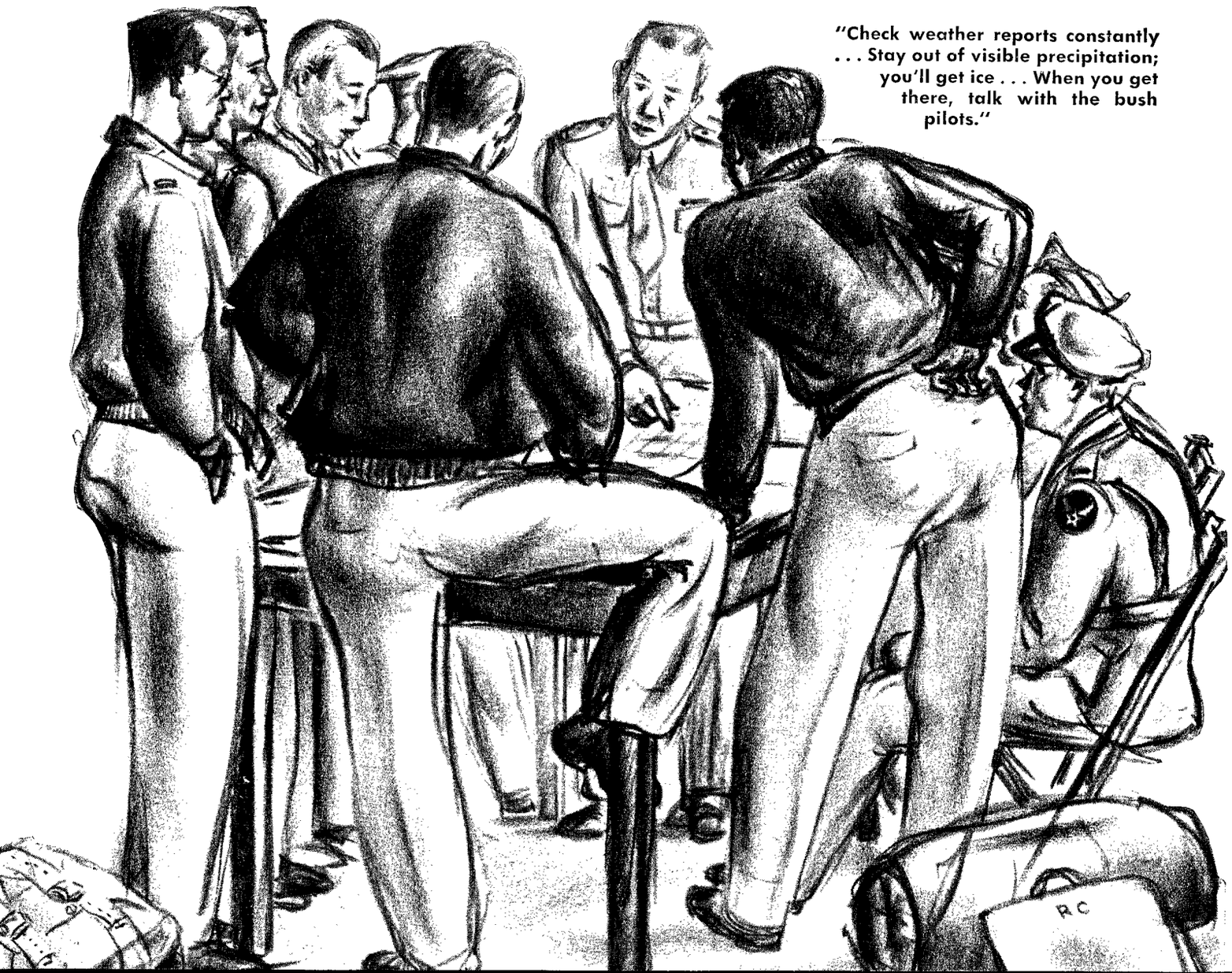
Dispersed around the hangars and on the apron are Army airplanes of every description. B-17s and 25s. A-20s. P-40s and 38s. Numerous cargo planes. Every ship has chalk marks on its olive-drab skin. FULL SERVICE—O. K. GUNS CLEANED AND LOADED—O. K.

In the shops and hangars are scores of civilian workers, many of them women. Driving around in trucks and jeeps, standing on step-ladders and bending over engines, are enlisted men in coveralls. Standing about in groups, just waiting or keeping an eye on work, are the pilots. They are wearing fur-lined caps and flying suits and close by them are parachutes with built-in arctic kits.

These kits, if needed, will be handily complete. Each one contains a frying pan, compass, trout flies and line, little white pills with which to start fires, iodine to purify water, field rations, mosquito netting and fly oil, bouillon cubes, matches, pistol ball, gloves, and a sturdy knife. Every flyer wears a pistol at all times during a flight.

This happens to be a clear day, without a cloud visible in the blue dome of Montana sky. There's little rain here, in any season. From the control tower you can see for miles over bald, treeless hills and plains to the purple Rockies in the distance. The sides of the bench drop away sheerly to the surrounding valleys through which runs the upper Missouri River, tumbling down Black Eagle Falls and Volta Falls, discovered by Lewis and Clark in 1805. Some miles off is a well-known landmark---the 510-foot smokestack of Anaconda Copper's great smelter.

From time to time new airplanes from the south approach the field and the CAA man is busy at the *(Continued on next page)*



"Check weather reports constantly . . . Stay out of visible precipitation; you'll get ice . . . When you get there, talk with the bush pilots."

What's your AIR FORCE I.Q.

Here it is again! This month's AIR FORCE Quiz is a little tougher. Score 5 points for each question answered correctly. From the grades made by a group of officers and enlisted men—100 is perfect; 90 is excellent; 80 is good; 70 is passing; 60 is—well, you can do better! Answers printed on page 40.

1. The empennage of a plane is

a. The nacelle
b. The tail assembly
c. The wing structure
d. The instrument panel

2. A bubble octant is used to measure the

a. Amount of gas in a tank
b. Air speed
c. Oil pressure
d. Angle of elevation of a celestial body

3. A Blenheim bomber is

a. A U. S. plane b. A German plane
c. A British plane d. An Italian plane

4. The first successful powered flight by the Wright brothers took place at Kittyhawk in

a. 1909 b. 1896
c. 1903 d. 1918

5. The term Logistics as used by the military applies to

a. Special logarithm tables used in Quartermaster accounting
b. The art of log rolling
c. The details of moving, quartering and provisioning of troops
d. A logical argument employing military statistics

6. Which of the following words does not belong in this group?

a. Cirrus b. Status
c. Stratus d. Cumulus

7. A Pitot Tube is most closely connected with

a. Lubrication
b. Air speed
c. Propeller maintenance
d. Gasoline mixture

8. Kiska is located in

a. Russia b. The South Pacific
c. The Aleutians d. The North Atlantic

9. Phosgene has an odor like

a. Pepper
b. Apple blossoms
c. Fly paper
d. New mown hay or freshly cut corn

10. The B-25 is a

a. Low-wing monoplane
b. Mid-wing monoplane
c. High-wing monoplane
d. Biplane

11. For installing sparkplugs, Tech Orders state that the length of the wrench should be

a. 20 inches b. 36 inches
c. 10 inches or less d. 18 inches

12. Stewart Field is located

a. In Texas b. In California
c. Near West Point d. In Missouri

TRUE OR FALSE?

13. The B-24 has a tricycle landing gear.

a. True b. False

14. The pilot, bombardier and navigator are the only members of a typical heavy bomber combat crew who are qualified to wear wings.

a. True b. False

15. A radial engine is a liquid cooled engine.

a. True b. False

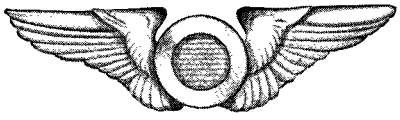
16. The letters BT are the Air Forces designation for Bombardment Tactics.

a. True b. False

17. When walking with a senior officer, the junior walks on the left; when riding in an automobile, the junior should be on the right.

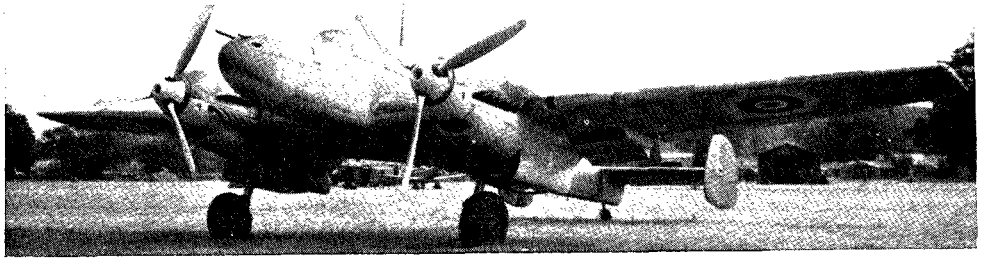
a. True b. False

18. Identify this Army Air Forces wing insignia:



19. What country uses this marking on its military planes:

20. Identify the plane below:



GREAT FALLS

(Continued from Page 9)

microphone, giving the flyers landing instructions, reminding them always to have "wheels down and pressure up."

Several fighter planes have been warming up and now they taxi down to the end of the runway. They will, when possible, go north in a flight, with some experienced pilot leading the newer men.

"Army Number —— calling Great Falls tower."

"Great Falls tower," answers the CAA man. "Army Number —— clear to Runway 21." He then gives the code signal for the day, the time, wind direction, velocity, and other data.

One after another the planes speed along the runway. They use nearly all of it, going right to the edge of the bench, for when you fly off this shelf of land you're in the air. They bank to the south, make a wide circle, like homing pigeons deciding on their course, then strike due north.

Now a B-17 is on the runway. It doesn't seem to have enough speed to take off but this is a deception. It's in the air quicker than the fighters.

A pair of B-25s follow shortly after. These ships are probably being flown by Lieutenants Hughes and Stenson; their cards were seen hanging on hooks of the DEPART TODAY column. With them are two sergeant flyers, new men who are taking their first trip as co-pilots.

All these ferrying pilots will be gone about a week, more or less. They will return in empty cargo planes and have a day off when they arrive in Great Falls.

They will no doubt come back with some Paul Bunyan-esque tales. And a good many of these tales will concern bears.

There was the time, for example, back in summer, when a couple of pilots left their clothes on the bank of a pond and went swimming. A bear, after picking the pockets of the uniforms, attacked the men. One pilot got away. The other found himself at close quarters, about to be clawed.

Somewhere he had heard that bear noses are tender. After twenty or more lefts and rights to the muzzle with his fists, he won a judge's decision and drove the animal away.

On several of the flying fields soldiers have to patrol the runways at night in jeeps to keep the bears away; where gasoline is cached in the woods along the route, guard duty is also no joke.

Aside from bear trouble, the pilots will find much to occupy their spare time. Perhaps they will fish or hunt. Perhaps they will find or buy at a bargain some mastodon ivory. Perhaps they will enjoy themselves aboard The Yukon Maid and other river boats of the gold rush days that are still to be seen around Whitehorse.

Whatever else they do, they will come back with information that will be invaluable to all who are engaged in the serious business of getting military aircraft to places where they are sorely needed. ☆

THE OTHER NORTH AFRICAN BATTLE

Prepared by the Directorate of Weather,

HEADQUARTERS, AAF

PHOTOS of military operations in North Africa usually show clouds of dust and sand, sweat-drenched and sun-tanned men.

But there is another serious weather hazard—rain. When it rains hard in the desert the rain brings mud and sometimes destructive floods. Operations can generally proceed in heat and dust, but not in rain.

Weather in this area is typical of desert conditions in many parts of the world. Annual and diurnal temperature ranges are great, and, away from the coast, overnight freezes occur. Great air bumpiness is experienced in summer, especially inland.

Generally the weather here may be divided into two periods, the hot dry period from June to September, and the dust- or rain-storm period from September to May. Dryness and temperature increase from west to east and north to south. Spring and fall are the best operational seasons.

Mean summer temperatures range from 66 degrees to 88 degrees on the coast and from 72 degrees to 100 degrees inland. Temperatures over 100 degrees are common. Highest temperatures are frequently recorded in June, although July or August has the highest mean temperatures. Dryness and temperature increase as one proceeds from Tripoli toward Egypt.

In the interior the rapidity of heating causes air currents which make flying rough, particularly at low altitudes. Rapid heating also causes lifting power and much fine sand and dust is carried into the air. Whirling sand may reduce visibility to almost zero and develop sandstorms known as "simooms" in Libya and "haboobs" in Egypt, which sometimes reach the coast.

Rapid heating in the desert air also causes visual distortion. Heat waves emanating from the superheated sand and rock make

Weather is the second enemy confronting airmen in the desert war theater.

perception of ground features from the air a very difficult problem.

Cloudiness is rare during the summer, although cumulus and even some stratus cloud is occasionally encountered along the coast. Cloud cover for low-flying operations is hardly ever found. Early morning fogs occur on as many as 7½ days a month in some places, but they burn off quickly.

Landing on untreated areas or traveling over unpaved roads throws up huge clouds of dust. Keeping mechanical equipment well-lubricated and free from dirt is a difficult problem.

In September, the low pressure areas created by cyclonic storms begin to take a more southerly course, passing through the Mediterranean, inaugurating the long period of rain and dust storms which continues through May. In the summer, these cyclonic storms pass to the north and usually, do not affect weather in the North African area.

Rainy weather begins gradually. Rains are rather infrequent in the fall. In Libya, there are 1 to 3 days rainfall in September, which increases to 4 to 9 days rainfall in November. In Egypt, the rains come later, with only 3 to 4 days in November. Rainfall increases in December and January and then tapers off gradually. Highest rainfall is experienced in Cyrenaica.

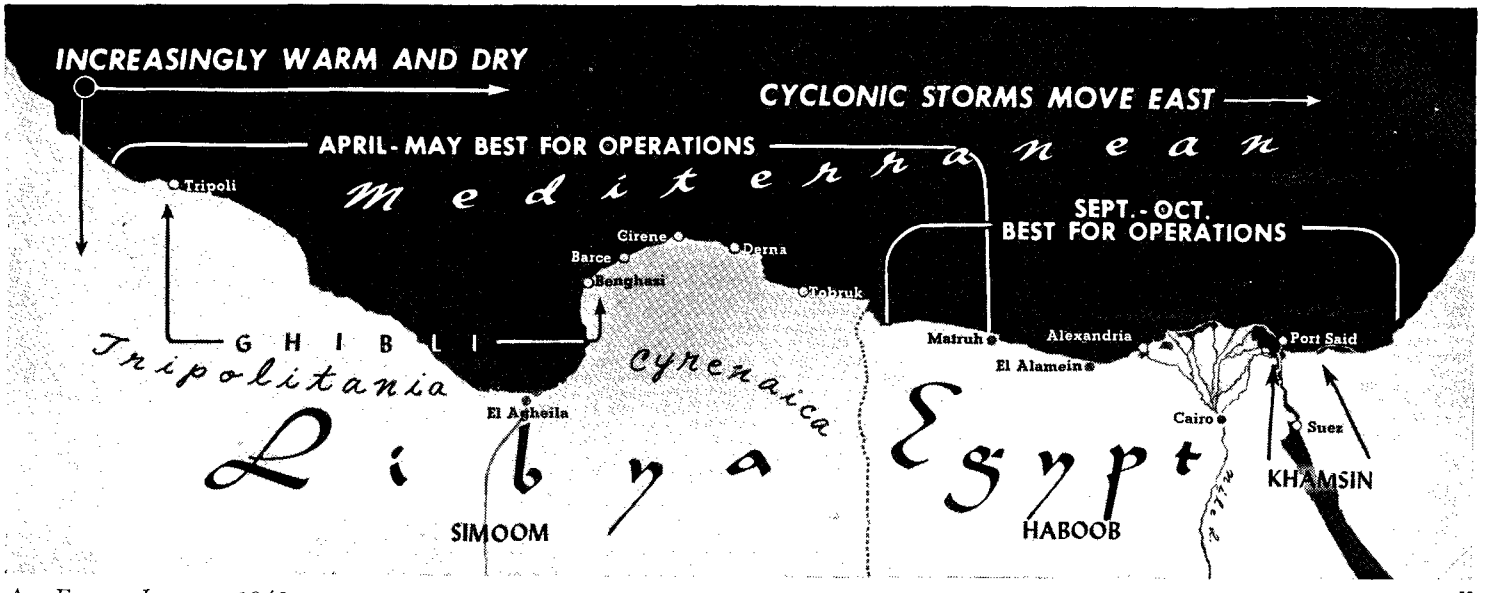
Average cloudiness continues throughout the fall, reaching a maximum of 50 to 60 percent coverage in December, January and February. In Egypt—that is, east of Cyrenaica—the cloud cover is generally between 38 and 40 percent, although Alexandria has a 50 percent coverage in December and January. Mean winter temperatures range between 50 and 70 degrees, with the warmer to the east. Temperatures gradually decrease throughout the fall to winter lows, then gradually increase to summer highs.

Dry dust winds off the desert have their greatest incidence in fall and spring, although any given year may show a wide departure from the average. In Egypt, a dust storm known as the "khamsin" occurs during the period from February to May inclusive, the greatest frequency being in April. The occurrence of such storms is about 12 a year, although they may vary in any one year from 5 to 6 or 16 to 18. In Libya, "ghibli" is the term applied to dry, hot and at times dusty winds originating over the desert.

Dustiness is variable. Sometimes the wind is a continuation of the simoom and then the ghibli is extremely dusty. There is a higher frequency of these winds in Tripolitania than in Cyrenaica. Spring and, particularly, fall are the seasons of most frequent occurrence.

In the west, air operations are least hindered by weather factors in the spring, although fall is also good. Predictable cyclonic activity will bring enough cloud cover to form some protection for aircraft. Good visibility is frequent and usually there is not enough rain to hamper land, sea or air operations. Probable occurrence of the ghibli must be predicted by observing the positions of lows on synoptic charts. Temperatures are not as extreme as in summer.

In the Egyptian area, the season best adapted for air operations is fall. The frequency of good operational weather in the spring is reduced by the high incidence of the khamsin in this season. ☆



COMPARING the relative merits of friendly and enemy aircraft is more than a favorite diversion; it is a serious business to combat airmen and to all who are responsible for assuring that our own aircraft are superior to those of the enemy.

It is not intended here to draw conclusions on the merits of friendly and enemy aircraft but rather to present a few important characteristics of some well known foreign combat airplanes in order to facilitate analyzing the relative technical value of these planes. For it is obvious that the combat effectiveness of an air force is measured not only by good combat personnel but by technical leadership as well.

Early reports on new or unfamiliar foreign aircraft have sometimes greatly minimized their equipment or have attributed extraordinary performance, armament and the like to them. Claims that German and Japanese airplanes were equipped with only a few instruments and were poorly constructed of unsatisfactory substitute materials have not been substantiated by fact. On the other hand, the boasted superiority of speed, high operating altitude and fire power claimed for some enemy aircraft have largely been disproved by experience of our fighting operations or are known to have been obtained at too great sacrifice.

Germany has developed a large number of various types of airplanes, but those which have appeared prominently in reports from the fighting areas include only the Me 109E and F, Ju 87B, Ju 86P, He 177, FW 190 and the Do 217E.

The latest improved version of the Messerschmitt fighter is the Me 109F1 and F2. The design of the Me 109 has been refined to increase its speed to approximately 370 miles per hour and give it a higher service altitude (38,000 feet). In order to accomplish this, low drag radiators have been installed and the armament has been reduced to one cannon (20 mm or 15 mm) firing through the hub of the propeller and two 7.9 mm (30 caliber) guns mounted in the nose of the fuselage on top of the engine. However, the cannon have a high rate of fire: 800 rounds per minute for the 20 mm in the Me 109F1 and 900 rounds per minute for the 15 mm in the Me 109 F2.

Armor plate has improved progressively in the Me 109 series to give optimum protection. The new type of armor arrangement consists of homogeneous armor plate under and back of the pilot, extending well up behind and over his head. Also, an unusual type of deflector bulkhead, comprised of thirty laminations of aluminum alloy sheets, is located back of the seat-shaped fuel tank.

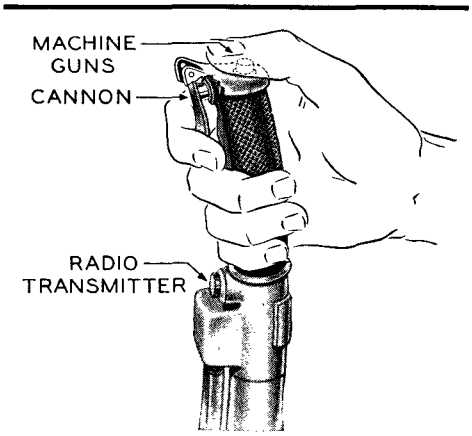


Diagram of a control column handle of Messerschmitt type.

The Junkers Ju 87 (Stuka) obtained distinction early in the war by its use in dive bombing and ground strafing of Allied troops and civilian personnel, particularly during the occupation of the Low Countries and France. This airplane has an ungainly appearance, with its inverted gull wing, projecting dive brakes and fixed landing gear. It is slow and easy prey for a fighter.

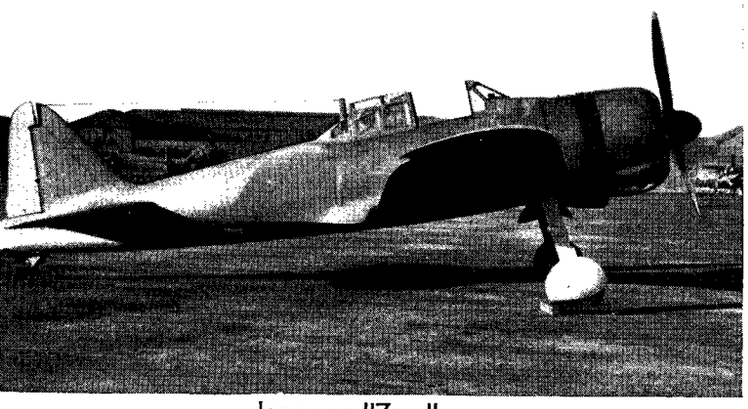
THE two-engine Junkers Ju 86 is a medium bomber, the late versions of which have been given a pressurized cabin. It has been seen at 42,000 feet in scattered raids over England but is believed to carry no armament, depending upon altitude for its protection.

The Heinkel He 177 is the first four-engine German bomber designed for use by the Luftwaffe. Although it is fitted with dive brakes, it has only been reported at high altitudes. The main point of interest in this airplane is its side by side arrangement of two engines in a single nacelle, each set of two engines driving one propeller. It is believed that the airplane can reduce its wing area in flight, permitting higher speeds after take-off.

The latest two-engine medium bomber of the Dornier family is the Do 217E which has special equipment for dive bombing. Many novel features have been included in the Do 217E including the 14 cylinder, double-

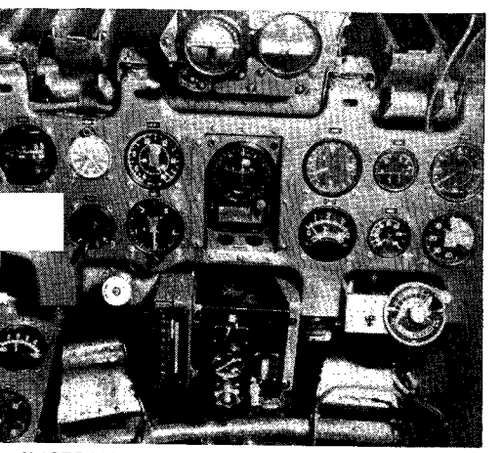
Italian Macchi 200

British "Spitfire"

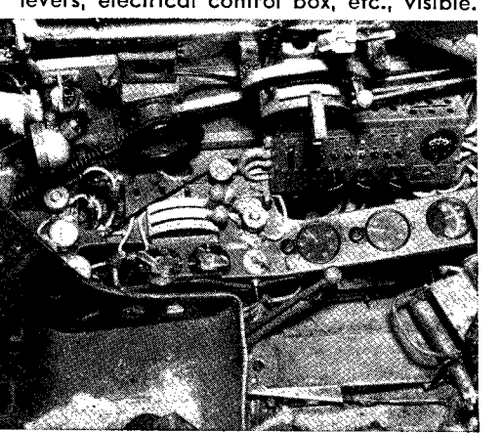


Japanese "Zero"

Our allies and enemies alike are adventuring with aircraft design. Here is a profile of some foreign planes in the news.



INSTRUMENT panel of the Japanese "Zero," showing full complement of gadgets. Below is a view of the left side of the cockpit, with propeller controls, trimming levers, electrical control box, etc., visible.



row, fan-cooled BMW-801 engine, hot air wing de-icing installation and an umbrella-shaped dive brake situated in the tail end of the fuselage.

The first fighter with an air-cooled engine used by the Germans in current operations is the Focke-Wulf FW 190. This aircraft is noteworthy for its compactness and simplicity of design. Reports indicate that it has excellent flying characteristics and that it combines speed, climb, ceiling and maneuverability into a fighter of significant quality. The FW 190, having four 20 mm cannon and two 7.9 mm guns, carries considerably more punch than its famed predecessors of the Messerschmitt series. Like the Do 217E, it has the BMW-801 engine, the main feature of which is a blower fan on the front of the engine revolving approximately two and one-half times the speed of the propeller and forcing cooling air through carefully designed channels around the cylinders. The fan cooling is intended to provide more efficient cooling on the ground, during climb when speed is reduced, and at altitudes where the air is of low density and presents difficulties regardless of the cold temperatures.

Some individual features found on German aircraft are of interest. The handle on the control stick of Messerschmitt planes, for instance, is arranged with a hinged latch that in one position prevents accidental operation of the thumb operated gun button. When flipped over, it uncovers the button and serves as a trigger for the cannon; thus both the cannon and the guns can be operated. A spring holds the latch in the safety position and the cannon button is operated only by the latch which can engage the button. For radio transmission a small switch button is situated convenient to the little finger. On an extension of the throttle handle a pivoted thumb switch permits changing the propeller pitch without removing the hand from the throttle lever.

For a number of years, a heated-wing deicing system has been incorporated in German bombers. Hot air is obtained from a heat exchanger or muff around the exhaust manifold; the air is conducted through the leading edge of the wing, where it escapes through openings near the ailerons.

Many magnesium castings, some of considerable size, have been used in German airplanes. It has been estimated that a two-engine Ju 86 contained from 500 to 600 pounds of magnesium.

The Germans have placed emphasis on ease of maintenance, particularly on replacement of engines in a minimum of time. A crew unfamiliar with a Messerschmitt airplane completely removed a DB-601 engine in less than twenty minutes.

THESE wily Japanese, as usual, have done a good job of copying the developments of engineers in other countries. However, it is inevitable with such a policy that the original examples are obsolete by the time they are adopted.

The well-known Zero, generally the name given the Mitsubishi "00" fighter, is primarily an interceptor because of a high rate of climb made possible by reductions in weight, resulting *(Continued on next page)*

FOREIGN AIRCRAFT

(Continued from Page 13)

mainly from the elimination of passive defense measures. It packs a good punch with its two 20 mm cannon and two 7.7 machine guns but the lack of defensive armor plate and leak-proof fuel tanks make the Zero extremely vulnerable. A large internal fuel capacity augmented by an external auxiliary tank totaling 215 gallons give it a long range, estimated at over 1,200 miles.

The carrier-borne Aichi 99 is the standard Japanese dive bomber which has been used extensively in attacks such as the Pearl Harbor engagement. On the under side of the 48-foot wing, dive brakes are set as in the Junkers Ju 87. There is no armor nor leak-proof tanks and the two fixed nose guns and one flexible rear gun are of small caliber (7.7 mm equivalent to our 30 caliber). The fixed machine guns are believed to be adaptations of a German gun; the flexible types are modifications of the obsolete Lewis.

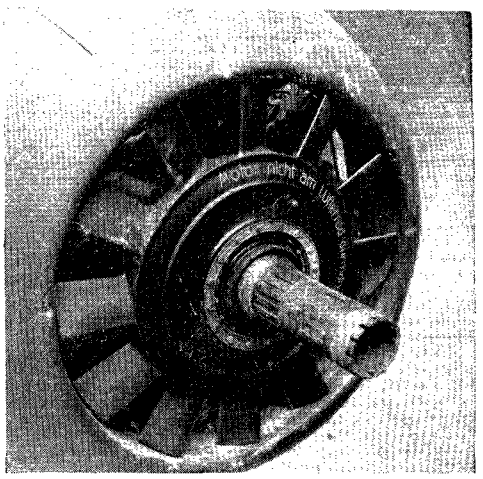
A PLANE closely resembling our Douglas A-24 is the Nakajima 97, which is essentially a torpedo bomber. This plane has been used by the Japanese Navy to carry a 1,700-pound torpedo or two 550-pound bombs. The Mitsubishi 97 (Army), evidently available in large quantities, has been the outstanding Japanese heavy bomber. The bomb load is reputed to be 4,400 pounds and with this load it is believed to have a range of at least 1,200 miles at 190 miles per hour. Four-engine Japanese airplanes reported in operation are mostly the Kawanishi flying boat closely resembling a Sikorsky design; occasionally the German type FW-200; and possibly a model patterned after the DC-4.

Although Italy has produced a fairly large number of airplanes of different types, some of which embody good aeronautical features, there is no indication that the performance of any Italian aircraft is comparable to current models being produced by the leading nations. The Italians show slight progress over the Japanese in equipping their aircraft with armor plate and fuel tank protection. But even in their standard combat airplanes, the Italians seem to have kept their armor to a minimum. The usual gun arrangement in their best front line fighters is two 12.7 mm (50 caliber) machine guns. It has been noted that the majority of Italian fighters are equipped to carry a quantity of light bombs (i. e. 144 two-pound bombs on the Macchi 200) which are dropped and set to explode in front of enemy bombers.

The Macchi 200, originally having a Fiat 840 horsepower 14-cylinder, air-cooled engine, is a fighter which has been in considerable action. The radial engine is being replaced by a German DB-601 liquid-cooled in-line engine which gives it a high speed (in the neighborhood of 325 miles per hour) and an initial climbing rate of 3,000 feet per minute.

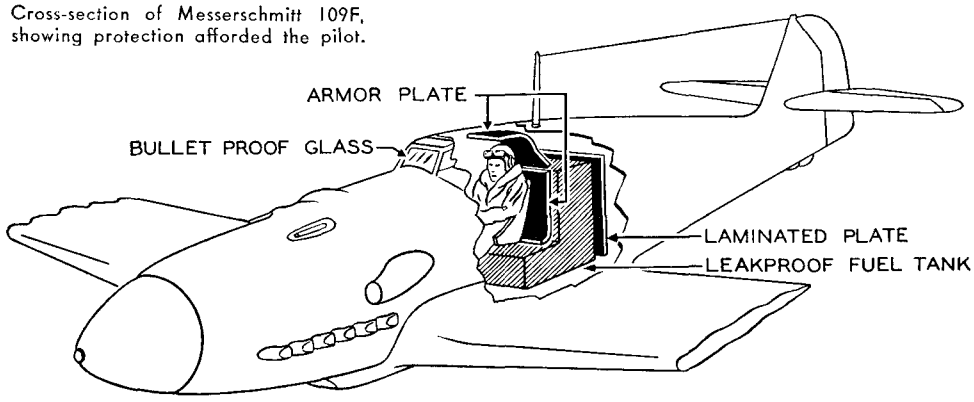
Italy's outstanding long-range bomber is the Savoia-Marchetti SM 79. This tri-motor, four-place monoplane has an estimated high speed of 295 miles per hour at 16,400 feet and is capable of carrying a maximum load of 4,400 pounds of bombs or torpedoes. Power is supplied by three 1,000 horsepower Piaggio 14-cylinder air-cooled engines. The Italians have been known to design some excellent engines and airplanes but shortages of materials and the strain of war conditions obviously have seriously curtailed their production of airplanes and interfered with any aeronautical development program.

PERFORMANCE data on Russia's combat type airplanes is seldom officially disclosed. The Stormovik IL-2 fighter has been used extensively in attacks against tanks. It mounts two large caliber cannon as well as two 7.6 mm machine guns. This armament is complemented by rocket projectiles which have been found especially effective against tanks and ground installations. Pilot and engine are protected with an abundance of armor plate.



The German engine BMW-801, used in the Focke-Wulf FW-190 and the Dornier Do-217, has a fan on the propeller hub which forces cooling air through carefully designed channels around the cylinders.

Cross-section of Messerschmitt 109F, showing protection afforded the pilot.



The DB-3F is Russia's best medium bomber; it possesses excellent handling characteristics, has a high speed of 270 miles per hour and good armor protection. The light bomber PE-2 has a very trim appearance with two in-line engines and a well-streamlined fuselage. Other Russian airplanes include the RATA I-16 fighter—short and stubby with a radial engine; the MIG-3 fighter, with a top speed reputed to be 390 miles per hour; the LAGG-3 fighter with an in-line engine and smooth lines broken only underneath by two well-faired scoops; the two-engine YAK-4 attack bomber; and the four-engine TB-7 heavy bomber with two inboard engines carrying the cooling systems for the outboard engines in large underslung nacelles which also house the landing gear and provide a limited space for rear gun positions.

British historians will record for all time the part which the Hurricanes and Spitfires played in the Battle of Britain. While the Hurricane is fading out of the picture somewhat, new model Spitfires are maintaining their reputation as the outstanding British fighter. The latest Spitfire design, with a Rolls-Royce Merlin XLV 1,210 horsepower power plant, attains a high speed of 375 miles per hour at 20,000 feet.

The Bristol "Beaufighter" is a fast, two-engine night fighter, interceptor or attack plane. Its range, 1,500 miles, and a maximum speed of 330 miles per hour, has made it suitable for long range patrol by the Coastal Command. It can reach a service ceiling of 33,000 feet; its armament includes four 20 mm nose cannon and six .303 fixed wing guns.

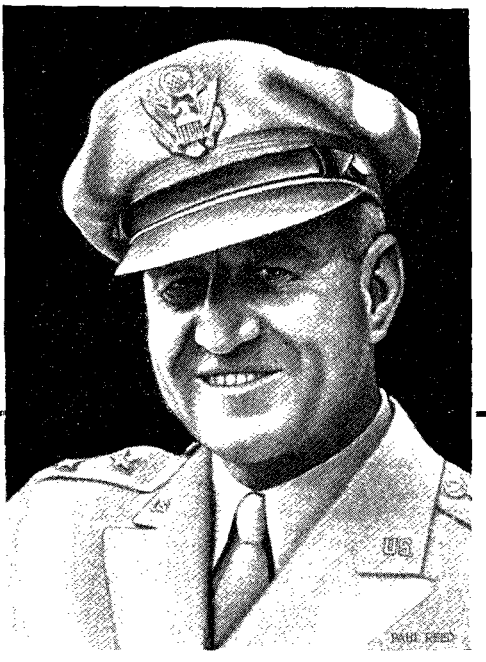
Bombers have been developed considerably by the British. In the two-engine class the Wellington and the Blenheim are prominent. For long range and heavy bombardment the English take pride in their four-engine airplanes, the Stirling, Halifax and Lancaster. The Short Stirling I has taken off with a bomb load of approximately ten tons. The Handley-Page Halifax is not far behind the Stirling in load carrying capacity. In the more efficient Avro Lancaster, a heavy bomb load (12,000 pounds) can be carried 1,200 miles.

All of these four-engine heavy bombers are equipped with .303 machine guns in the turrets, flexible and fixed positions. As the British, until recently, restricted their long range bombing operations to night time, the small caliber guns have been considered adequate protection. The duties of distant sea patrol have been taken by the large four-engine Short Sunderland flying boat.

In friend or foe we can admire the products of engineering skill. ☆

Combat Notes From Down Under

An analysis of Army Air Forces operations in the Southwest Pacific.



By Major General Ralph Royce

COMMANDING GENERAL, SOUTHEAST ARMY AIR FORCES TRAINING CENTER

AIR FORCE has asked me to tell you something of the conditions we face in fighting the Japanese in the Southwest Pacific.

The problems are many-fold, and we should face them frankly. Many of the problems have been overcome, for much pioneering has been done, but a lot of hard work lies ahead. The Jap is a ruthless and competent enemy, and nature causes hardships that are almost as bad as the Jap himself.

But I have found that our men of the Air Forces—whether Army, Navy or Marine—do their work uncomplainingly and set up great records in fighting and in maintenance. Our equipment is second to none, and we can match the enemy everywhere in skill and courage—in the air, on the ground and on the sea. We can have implicit faith in our final victory over him.

The key to our operations in the Southwest Pacific theater is, of course, the island continent of Australia. I arrived in Australia shortly before the fall of Java. Ours had been the last American plane to come into Java from India.

Australia is almost as big as the United States, but supports only slightly more than 7,000,000 people, over half of whom live along the east coast in the large cities of Sydney, Brisbane and Adelaide. Most of the industries are grouped around these metropolitan areas, which in turn are largely dependent on the Murray River Valley in the southeastern part of the continent, the main agricultural region.

West of the eastern coast range is a large semi-arid region which the Australians call the "Bush." The country is so dry that the average Australian does not figure on so many sheep to the acre, but rather on how many acres will support one sheep. Beyond the Bush stretches the western desert. When means are found for irrigating this vast arid region, Australia will be able to support a much larger population.

Because of the vastness of the land, combined with its characteristics and the shortage of population, practically no development of highways or railroads has taken place beyond the vicinity of the large cities along the eastern coast range. In the early days each state was developed separately. Jealous of its independence, each built its own railroad—with its separate gauge.

All of this is of vital importance to our operations. The network of independent railroads, for instance, always creates difficulty in the movement of our supplies. If an airplane engine is unloaded at Adelaide in the south, to be shipped 2,500 miles to Townsville in the north, we have to unload and load it several different times.

TO MOVE our equipment from Adelaide to Darwin, we have to make the first part of the journey by a slow, narrow-gauge railroad to Alice Springs, almost in the center of the continent, because there is no passable highway to that point from Adelaide. From Alice Springs to the small town of Birdum, some 200 miles south of Darwin, the Australian engineers built a military highway for 600 miles over the desert. Our engineers are now helping to improve this highway. From Birdum to Darwin we trans-ship again on another small-gauge railway.

But even where there is an adequate railroad, the methods of operation and the equipment often are, by our standards, entirely out of date and, in most cases, cannot handle the heavy loads that we have to ship to our various bases. Australian freight cars have been known to break under the weight of one of our Army's prime movers. Moreover, one is unable to turn to the roads, because they are usually impassable except in the extremely dry season. I have known many of our large units to be stuck for as long as a month, although we desperately needed them in the combat zone. Of course, such conditions make air transport vital to our operations. To a great extent we found that it can alleviate many of the transportation problems just mentioned.

Communications, likewise, both for ourselves and the Australians, cause many headaches. Inadequate telegraph and telephone lines were overtaxed even in peace-time. They cannot begin to handle the volume of military business. We turned to the greatly expanded use of radio, but this forced us to encode and decode. Not only did we have to use many additional operatives, but we lost precious time in actual combat operations.

In the matter of airports, Australia is not so bad. Before the war the people had developed a system of airplane ambulances—flown by young doctors who had learned to fly in order to take care of the people who lived hundreds of miles removed from any large center of population. Ranches were equipped with what is known as pedal radio sets, permitting calls for medical aid in the quickest possible time. But the airports used for this purpose, while numerous, were not well situated from a tactical standpoint, nor were they large enough to accommodate our heavy, fast military aircraft.

Moreover, it was found impossible to create large fields as we know them in the United States because of the rocky nature of the terrain, or, in the extreme north, because of dense woods and the lack of heavy bulldozers and earth-moving equipment.

This and a fast-moving tactical picture forced the building of operational strips, 6,000 feet long, 300 feet wide, with the middle hard-surfaced to stand heavy bomber operations. This construction, of course, destroyed the top soil, and then the dust problem became acute. Dust got into every moving part that we used: engines, wheels, machine-guns and trucks. At one island airport the dust was fifty percent pure iron oxide. You can imagine what this did to our engines. *(Continued on Page 40)*

Notes from the Air Surgeon's Office:

How to Keep Well in the ALASKAN THEATER

Brigadier General David N. W. Grant

THE AIR SURGEON

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

THE following article is the second of a series on health conditions in the various theaters of operation.—THE EDITOR.

THERE are fewer conveniences, more severe winters and greater distances between inhabited areas, but service in Alaska has many similarities to service in the more remote rural sections of the northwestern part of the United States.

Topography and climate account for local variations in living conditions. Winters are coldest in the inland valleys that are surrounded by high mountains; summers are uncomfortable, due both to heat and humidity, especially on the flat tundra of the far north where the sun does not set and the land becomes a vast swamp after the spring thaws.

As far as the individual soldier is concerned, the general problems that influence health in Alaska are for the most part related to hygiene and sanitation, and to obtaining protection from the cold.

When men live in remote areas, they are inclined, especially during cold weather, to become careless with regard to hygiene and sanitation. It is hard to bathe in zero weather; yet experience soon teaches that we will suffer from various skin ailments and become unpopular with our friends if we don't keep clean.

LONG beards should not be worn if the individual will be out-of-doors much of the time. The moisture of the breath accumulates on the whiskers, and freezes, so that there is danger of freezing the skin. If beards are worn they should be clipped short. Shaving should be done before going to bed, for if it is done in the morning, the face will become chapped.

Even in uninhabited districts, strict sanitary discipline will have to be enforced. Sewage deposited on snow in the winter time will be spread over wide areas when the snow melts. It is significant that typhoid fever, a disease not uncommon in all parts of Alaska, is most frequently encountered shortly after the spring thaws begin.

It is always necessary to be certain that water is safe before drinking it. Be sure that the area is absolutely uninhabited upstream before trusting to luck and drinking from a stream. When there is any doubt, drink tea or coffee, or use one of the procedures prescribed in FM 8-40.

Many of the native women (Indian and Eskimo) have venereal diseases, and tuberculosis is quite prevalent among them, so it is best that they be avoided.

THE cold winter climate will influence every act of life from early fall until late spring. Because of the extreme cold, individuals from warmer climates are inclined to disregard the proper ventilation of dwellings. This is very dangerous, for most buildings are heated by means of small wood or coal stoves. Unless there is adequate ventilation, these stoves are apt to produce a very poisonous gas — carbon monoxide. This gas does not have an odor; there is no warning of its presence until the victim is unconscious.

Gasoline engines also produce carbon monoxide, so it is dangerous to operate an airplane motor in a hangar or run an automobile engine in order to keep the heater warm, unless the hangar is well ventilated, or the car is moving. Be sure automobile exhaust pipes are not broken by hitting stumps or snowdrifts, otherwise the gas is liable to penetrate into the car even if it is in motion.

When a closed vehicle becomes stalled in the snow, the engine is generally left running to keep the occupants warm and to avoid difficulty in re-starting. If snow drifts over the exhaust and carbon monoxide fills the vehicle, the occupants may be overcome with gas. Meanwhile, the gasoline may become exhausted. Later, when the vehicle is found, it looks as if the occupants had frozen to death.

In a stalled vehicle always keep the exhaust pipe open by getting out frequently and cleaning away the drifted snow. *Don't go to sleep* in a closed car with the motor running! If you must sleep, open the window enough for a slight draft and rest your head against the glass with your face in the draft. It is possible to insure adequate ventilation without chilling, if windows on the lee side of a building or of a car are opened. Take turns in sleeping.

When traveling, a vehicle should always contain at least two men, and one vehicle should never travel alone. A lantern, a can of coal oil and a blanket will keep you warm and comfortable in a stalled vehicle, even in a blizzard, for several days. Wrap the blanket around you like a tent. Light the lantern and place it between your feet. A blizzard rarely lasts over three days.

Injuries due to the cold will constitute the greatest hazard that the individual will encounter during the winter time. Frostbite is the most common of these injuries. It usually affects the exposed parts of the body, such as the nose, cheek, chin, ears or the feet and hands. Tight clothes and shoes cut off the circulation and thus play an important part in bringing on this condition.

Frostbite most often occurs in cold dry weather where there is a strong wind. It is usually accompanied by a stinging pain, which gives way to numbness, but not infrequently there is only a sensation of cold and the individual does not realize that he has a frostbitten ear or nose. Serious injury may result if the individual does not become aware of it in a short time. He should have a companion inspect him at frequent intervals, looking for the typical gray or white appearance of frostbite. He should wrinkle his own face and wiggle his toes and fingers constantly.

If there is any stiffness of the skin, it should not be rubbed with snow, nor should the affected part be placed near a fire; it should be *(Continued on Page 22)*

DISTINGUISHED SERVICE CROSS

LIEUTENANT COLONELS: Francis R. Stevens*, Richard H. Carmichael. **CAPTAIN:** George Lavin, Jr. **LIEUTENANTS:** Jack Donaldson, Lyman Middleditch, Robert M. Wilde*. **MASTER SERGEANT:** William H. Prince.

DISTINGUISHED SERVICE MEDAL

MAJOR GENERALS: Herbert A. Dargue*, Clarence L. Tinker*. **COLONELS:** Charles Bundy*, Oliver S. Ferson*.

SILVER STAR

MAJORS: John D. Bridges, Edwin B. Broadhurst (also Purple Heart), Thomas J. Christian, John E. Dougherty, Thomas H. Hubbard, Kenneth R. Kreps, Oswald W. Lunde, William E. McDonald (also Purple Heart). **CAPTAINS:** Bruce H. Bennett, John Brownewell, John W. Carpenter 3d (also Oak Leaf Cluster), Kenneth Casper (also Oak Leaf Cluster), Henry J. Hawthorne, Maurice Horgan, Ben S. Irvin, John D. Mainwaring, Lewis B. Meng, Alvin J. Mueller (also Purple Heart and Distinguished Flying Cross), Robert Northcutt, George W. Prentice, Michael E. Sims, Allison W. Strauss*, Robert L. Williams. **LIEUTENANTS:** William H. Ambrosius, Stephen W. Andrew, Clyde H. Barnett, Jr., William G. Bennett, Marne Boelke, Theodore E. Burda, Wilson A. Chapman, David M. Conley, Samuel C. Cravens, Robert Debord. **MASTER SERGEANTS:** Roland A. Boone (also Oak Leaf Cluster), William J. P. Griffin, George Heard, Elving Moncrief, James E. Worley (also Oak Leaf Cluster). **STAFF SERGEANTS:** James B. Bunch, Robert Chopping, O. C. Cook, Meredith E. Durham, Orin W. Hawkins, Stanley C. Jackola (also Oak Leaf Cluster), Milton F. Kelm, John H. Lindgren, Douglas H. Logan, Albert L. Malok, Robert R. Noller, Wallace L. Olford, Leroy H. Penworden, Charles S. Savoini, Irvin S. Schier (also Oak Leaf Cluster), Robert W. Schlotte, Lorenzo H. Snow, Derwin D. Terry, Wiley C. Walters (also Purple Heart). **TECHNICAL SERGEANTS:** Walter Kolbus, John G. McKenna (also Oak Leaf Cluster), Arthur L. Richardson (also Purple Heart and Distinguished Flying Cross), Martin M. Schadl, Ralph J. Stiles, Coy H. Thomas, P. M. Vasalie, Clebert L. Washburg, Sam E. Weaver. **SERGEANTS:** Mario J. Filigenzi, Charles D. Franklin, Jr., Casimir J. Slodki, Charles H. Spencer (also Oak Leaf Cluster), Billie B. Sutton (also Purple Heart, Distinguished Flying Cross and Oak Leaf Cluster), George Sweedar, Franklyn L. Timberlake, Regis D. Weinfurther, Lloyd D. Whipp, Joseph O. Wingard, Kirk K. Wyatt. **CORPORALS:** Robert Alderson, Lowell A. Anderson* (also Purple Heart*), Norman A. Carlsen, Julian J. Champagne, W. D. Clarke, Francis M. Fowler, Harold E. Guse, Paul K. Harmon, Clarence M. Hoehn, Gary C. Hollister, Maurice L. Londer, Ralph I. Martin, Leonard M. Secor, Lonnie D. Wright. **PRIVATES FIRST CLASS:** George P. Marasci, Smith W. Radcliff. **PRIVATES:** Robert P. Elmerick, A. G. Osborn, Sydney Schwimmer, Harold Van Dorn, A. C. Wangler.

*Posthumous

PURPLE HEART

BRIGADIER GENERAL: William E. Farthing. **MAJORS:** Richard R. Barden, James V. Edmundson (also Distinguished Flying Cross). **CAPTAINS:** Nathaniel H. Blanton (also Oak Leaf Cluster), Arthur A. Fletcher, Jr., Francis C. Gideon, J. J. Kruzel (also Oak Leaf Cluster to Silver Star), Cuthbert L. Moseley, Jr. (also Oak Leaf Cluster), John Herbert Posten (also Oak Leaf Cluster), Stephen M. Smith, Percy Stoddart, Jr. **LIEUTENANTS:** Frank E. Angier, John R. Giddens, Stanley R. Holland, James A. Kaughtry, Verner E. Peterson, Marston C. Reed, Lyle A. Slocum*, Walter S. Smith, Harold Spire, Phillip Sprawls, William R. Ware (also Air Medal), Donald A. Walter*, Lewis P. Wells*, Lawrence Werner, Charles E. Windus, Anne G. Fox, Nurse Corps, for bravery in action at Hickam Field on December 7. She is the first woman to win this award. **FIRST SERGEANT:** Frank C. Devine. **STAFF SERGEANTS:** Edwin Smith, Anthony Leodora. **TECHNICAL SERGEANTS:** Joseph Markiewicz, Vincent Tooney. **SERGEANTS:** Kenneth A. Gradle (also Distinguished Flying Cross and Oak Leaf Cluster), Russell Huffman (also three Oak Leaf Clusters to Silver Star), Clevis Jones (also Oak Leaf Cluster to Silver Star), Howard Thompson, Riley R. Wilsey*, Robert L. Whitham*, James Wright*. **CORPORALS:** Bert Lee, Jr., Furman C. Martin, Jr., Kenneth E. Nelson (also Air Medal), Edgar L. Rogers*, Peter Wargo. **PRIVATES FIRST CLASS:** Charles J. Correll, Morris Moskowitz. **PRIVATES:** Blake C. Allshouse, Howard J. Beatty, Edwin T. Bottelson*, Gordon W. Boutellier, Norman M. Boutin, Joseph R. Drisner, Wildred Hellenbrand*, Richard G. McClung, Ben Odette, William Osborne, Walter H. Rockman, Newbra Ross, John H. Schwister, Walter Smith, Garrett C. Tyla. **AVIATION-STUDENT:** G. A. Plaster. **TECHNICIAN:** George L. Finkelstein.

DISTINGUISHED FLYING CROSS

LIEUTENANT GENERAL: George H. Brett. **MAJOR GENERAL:** Lewis Brereton. **LIEUTENANTS:** Edward Crouchley, William Joyner, James H. Mitchell*, Albert Thom, Manford K. Wagnon, Thomas N. Warren, Herbert C. White, Jr., McLyle G. Zumwalt. **SERGEANT:** Leslie Cain. **CORPORAL:** F. Ottauiano.

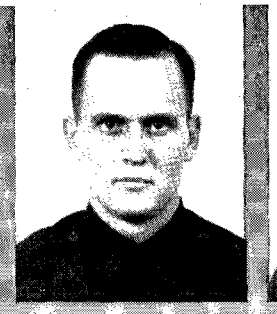
SOLDIER'S MEDAL

STAFF SERGEANTS: Verlan M. Davis, Rudolph R. Kudlack, William E. Petersen, Edgar T. Raezer, Jr., Eugene A. Rynerson. **SERGEANT:** Earnest L. Kilgore. **CORPORALS:** George Barnes, Bruce G. Benson, James M. Gilbreath. **PRIVATE FIRST CLASS:** John S. Stratton.

(Continued on Page 40)

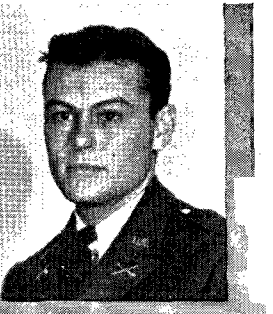
Sgt. Kenneth A. Gradle

Lt. Herbert C. White, Jr.



Lt. Richard S. Smith

Capt. Felix M. Hardison



Lt. Col. R. H. Carmichael

By Captain Roland Barnick

GOWEN FIELD, IDAHO

THEY called me The Admiral of the Bamboo Fleet.

That's because I flew a resurrected Navy amphibian between Bataan and Mindanao during the closing days of the Philippines battle.

The amphibian had a nickname, too. We called her The Duck.

There were eight of us in the Bamboo Fleet—Captains Jack Caldwell, Joe Moore, Jack Randolph, Bill Bradford, Harvey Whitfield and Dick Fellows, Sergeant Bill Strathern, and myself.

We were all Army Air Forces pilots who had come over with P-26s or P-40s long before Pearl Harbor. Four of us were serving our third year in the Philippines and all of us had been there at least eighteen months when war broke out.

Our P-40s, after the Jap attack, were all busy in combat but they didn't last too long. Some were shot down, some were riddled on the ground, some cracked up in operation.

But we still needed men and planes to maintain air transport communication between the islands of the Philippines.

That's where the Bamboo Fleet came in. It was organized in February, 1942, by the late Brigadier General Harold H. George to fly personnel out of Bataan and Corregidor, and to bring in food, quinine, and other supplies from Mindanao for the wounded among General MacArthur's ground forces.

Of over four planes, three were patched-up civilian ships that had never been meant for war-zone flying. The other was The Duck, a three-place Navy Grumman amphibian that had 700 horsepower and could do ninety miles an hour when the wind was right. The Duck was my plane and that's how I got dubbed The Admiral.

We found The Duck in Meriveles Bay at the foot of Bataan, across from Corregidor. She had been sunk there by Jap strafing about three months before the fall of Bataan.

When we decided to lift her out she was awash clear up to the propeller hub and had been that way for six weeks. But we finally got her up. We did it by means of a barge with a crane on it, a little ingenuity, and a lot of hard work. Dripping wet, the Duck didn't look too flyable.

The other three planes were commandeered by the U. S. government from civilians, natives of the Philippines.

One was a three-place Waco of ancient vintage with about 250 horsepower when it was feeling right and could have made ninety miles an hour if it had been new.

Another was a three-place Bellanca of about the same power and speed—so old and shaky that it had been condemned for private flying when we got it.

The other plane was our "speedster." It was a four-place Beechcraft that turned out 450 horsepower and could do about 170 miles an hour, if pushed.

That was the Bamboo Fleet. And it was appropriately named. The planes were all patched together with native bamboo and what other odds and ends we could find. Where there were no airplane tires around, we used truck tires. On one ship a caster from a wheelbarrow was used as a tail wheel. There wasn't a gun in the fleet.

The Duck was particularly lame. After we dug her out of the bay, we tied her wings on with baling wire, patched the fuselage with native wood, and fixed up the power plant with parts taken from other engines of different type and with miscellaneous parts from various aircraft.

I guess The Duck was held together mostly by faith. Repair of the Fleet, of course, was quite a problem. There were no spare parts to be had and there were few mechanics available. All pilots pitched in on service and repair work, and somehow we got by.

All of our flying was over enemy-held country or water. We would hop off from Bataan or Corregidor fields, fly to Cebu about 300 miles to the south, refuel at hidden bases there and then fly on to Mindanao —a total of 550 miles.

The planes were built to carry from 250 to 600 pounds pay load. We carried from 500 to 1,400 on every trip, with extra passengers going out, extra freight coming in.

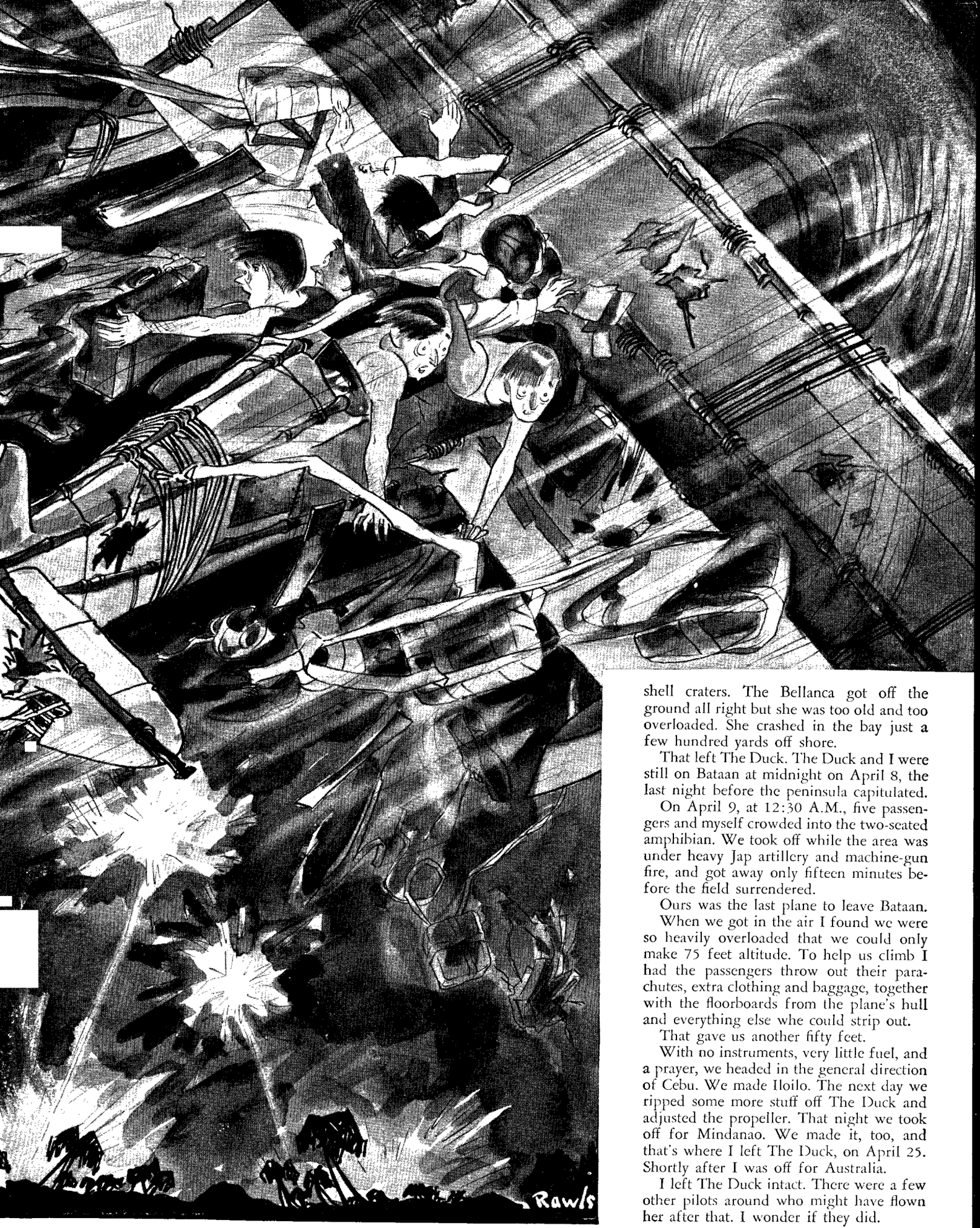
We made about 35 round trips in all, evacuating 100 to 120 personnel and bringing in tons of supplies.

The little planes of the Bamboo Fleet finally went down fighting.

The Waco got hers between Cebu and Del Monte in Mindanao. She had taken off from Cebu with three of our men aboard. But she didn't quite get away. Two Jap Navy patrol planes caught her in the air and literally burned her right out of the sky. The crew went with her.

Just about that time the Beechcraft got caught by the Japs in the air over Mindanao, had its landing gear wrecked, and made a crash landing. A Jap plane came in and shot it up on the ground.

The Bellanca was lost trying to get away from Corregidor. She had landed there somehow at night and had been hidden in a cove during the day; the next night she tried to take off down a sloping, unlighted runway that was badly pockmarked with



shell craters. The Bellanca got off the ground all right but she was too old and too overloaded. She crashed in the bay just a few hundred yards off shore.

That left The Duck. The Duck and I were still on Bataan at midnight on April 8, the last night before the peninsula capitulated.

On April 9, at 12:30 A.M., five passengers and myself crowded into the two-seated amphibian. We took off while the area was under heavy Jap artillery and machine-gun fire, and got away only fifteen minutes before the field surrendered.

Ours was the last plane to leave Bataan.

When we got in the air I found we were so heavily overloaded that we could only make 75 feet altitude. To help us climb I had the passengers throw out their parachutes, extra clothing and baggage, together with the floorboards from the plane's hull and everything else whe could strip out.

That gave us another fifty feet.

With no instruments, very little fuel, and a prayer, we headed in the general direction of Cebu. We made Iloilo. The next day we ripped some more stuff off The Duck and adjusted the propeller. That night we took off for Mindanao. We made it, too, and that's where I left The Duck, on April 25. Shortly after I was off for Australia.

I left The Duck intact. There were a few other pilots around who might have flown her after that. I wonder if they did.

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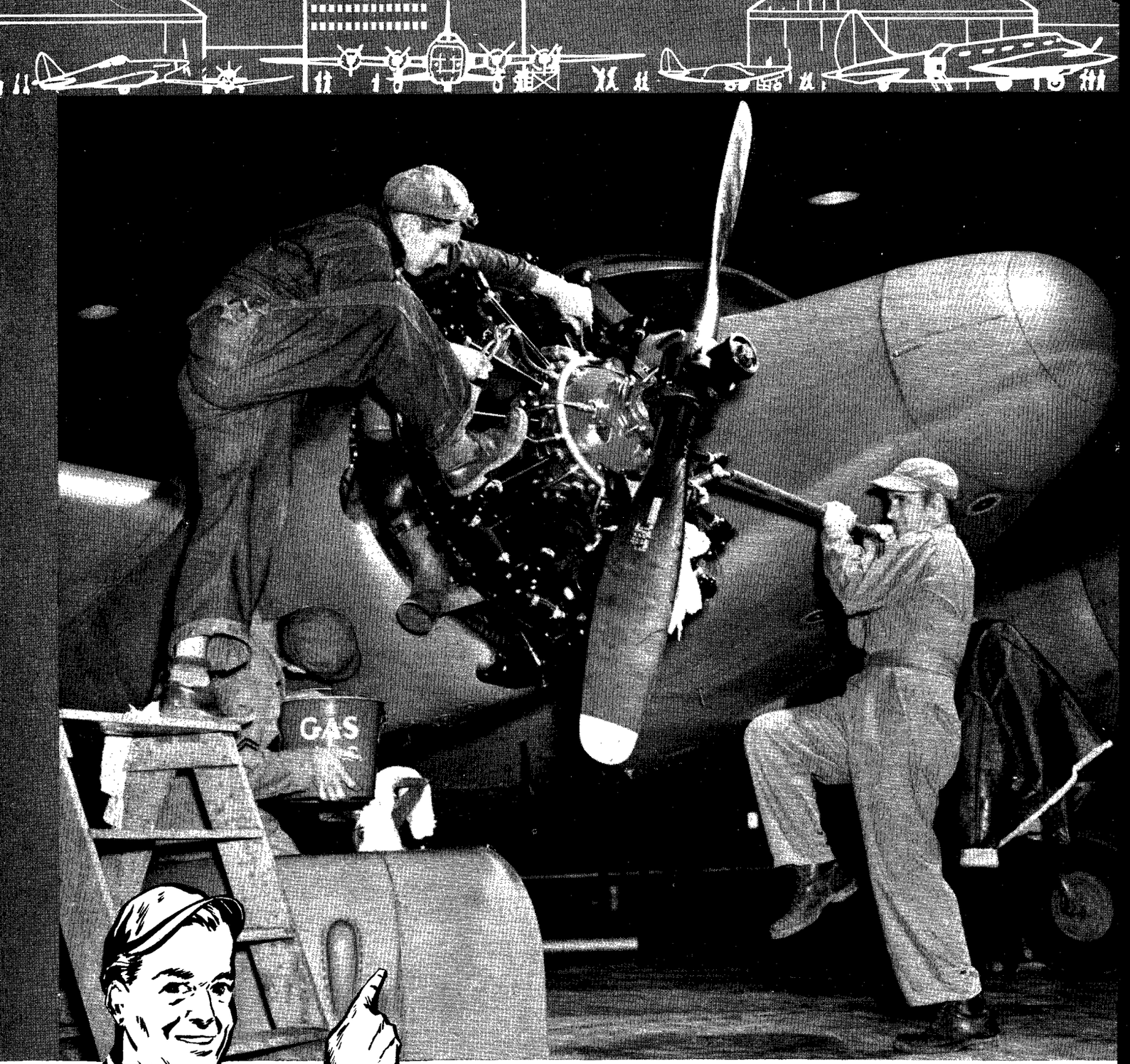
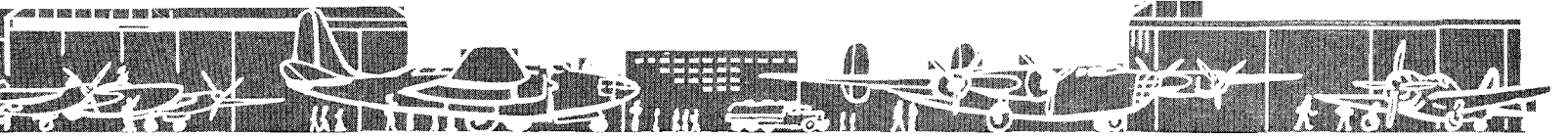


What's Wrong With This Picture?

PLENTY! It's so full of maintenance and safety boners that you should pick out the mistakes in "nothing flat". Are they obvious? Definitely. Funny? Definitely not. These boners—and others like them—are pulled every day by men who know better but just don't think, or who fail to read and follow TECH ORDERS and SERVICE MANUALS.

Naturally, in extreme emergencies and often on foreign combat fronts you'll have to improvise and use the ingenuity that makes AAF mechs tops in their work. But, as long as you can, it pays to use the right tools for the job—and it pays to *use your head.*

The mistakes in the picture are listed on the opposite page. Did you catch them all? Did we?



On the Line

A monthly roundup and exchange of hints and tips for mechs — some old, some new — in the interest of better maintenance.

THE OPEN SEASON on Mekiwis has started. (Mekiwis, of course, are planes grounded because of faulty maintenance). Men in maintenance and technical inspection work all over the country are sending in their suggestions on "Do's and Don'ts" of maintenance; telling us about prevalent boners that create Mekiwis.

The boners pictured at the left are the pet peeves of (left to right) S/Sgt. Harry E. Lyons, Cpl. Leo Pequiqnot and Sgt. Walter E. Wint, all of Headquarters Squadron, Air Service Command, Patterson Field, Ohio, who posed this picture for AIR FORCE.

Send your ideas and suggestions on improving maintenance to the AIR FORCE Editorial Office, 101 Park Avenue, New York, New York. This applies especially to you old timers who have a lot of ideas that make maintenance work easier, quicker and safer. Others need your tips, hints and short cuts for spotting trouble. We'll print as many as we have room for, giving full credit to contributors. (If you insist on staying anonymous, we'll string along.) Your suggestions will help others *get the Mekiwis off the ground.*

A Warrant Officer at a southern air base starts us off with these tips. Who's next?

TOUGH NUTS AND BOLTS . . .

Ever experience difficulty in starting nuts and washers on the hold-down studs while installing starters or generators? By using a bit of heavy grease, the flat washer can easily be positioned with the index finger. Or, with an old hacksaw blade and some masking tape which will bind it to the castellated nut, the starting of the nut on the stud threads can be made easier.

TIME SAVER . . .

Placing a pencil mark on the head of a bolt or stud which requires locking of the nut by a cotter pin or lock wire will save time. The pencil mark on the head of the bolt or stud, if directly in line with the cotter pin-hole, will always enable you to know under which castellation of the nut the pin-hole is hiding.

SAFETY NOTES . . .

When removing a carburetor, protect the rest of the engine by placing over the opening a piece of heavy stencil paper cut and punched to fit on the studs.

Always check the control locks before putting a plane to bed. Rudder banging from one extreme to another can cause failure of a control system in take-off or in flight.

Thanks to Mr. Mike Dietz, Chief Inspector at Patterson Field, Fairfield, Ohio, for the blue prints and tips on every-day maintenance mistakes appearing at the right.

MISTAKES ON OPPOSITE PAGE

Reading from Left to Right:

1. Look out there, Herkimer—you'll fall off that ladder. It's certainly too far from the engine for convenience or safety. (See A.C. Circular 130-2, Sept. 18, 1933.) What's more, you should be using the correct crew chief maintenance stand.

2. Sabotage! Get your foot off the rocker box and interconnecting lubricating lines. Reference: Common sense.

3. That spark plug high-tension lead wasn't made to hang on. You'll pull it loose. Reference: Common sense.

4. Good Lord, is that a pair of pliers you're using on the "hex" nut of the spark plug elbow? You'd better read T.O. No. 03-5E-1 and use the prescribed elbow wrench.

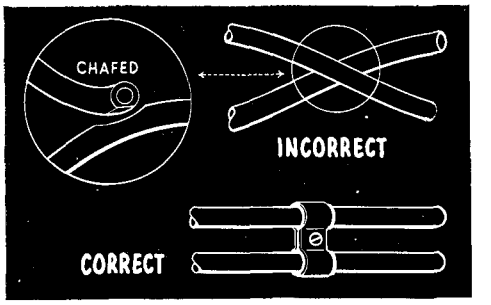
5. Hey, you, under the engine! You're a one man fire hazard draining gasoline in a closed hangar. You should have drained it outside the hangar. Read up on fire prevention in AAF Regulation 85-6. Incidentally, T.O. No. 01-1-1 requires all volatile fluids used for cleaning to be stored in and used from safety-type containers.

6. That cowling definitely should *NOT* be under the engine . . . and you'd better not let the crew chief catch you sitting on it.

7. Hey, stop it, you on the right. You'll freeze that spark plug so tight we'll never get it out. *NEVER* use an extension on a wrench to tighten plugs. The wrench shouldn't be over ten inches long. Better use a twelve-point or box wrench and the torque specified in T.O. No. 03-5E-1. And don't forget to put the anti-seize compound on those plugs.

8. Incidentally, that pitot tube wasn't put there for a coat rack. Oh, you're keeping the grit and dirt out? Then you'd better use the pitot tube cover as specified in T.O. No. 05-50-1.

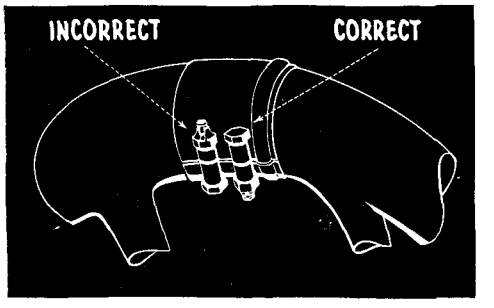
9. And don't forget to take that rag out of the engine. Believe it or not, a Tech Inspector recently found a yard of oily cloth in an intake tube.



COPPER, ALUMINUM TUBING

INCORRECT: Tubing not properly spaced and anchored; results in chafing and, in extreme cases, failure of system.

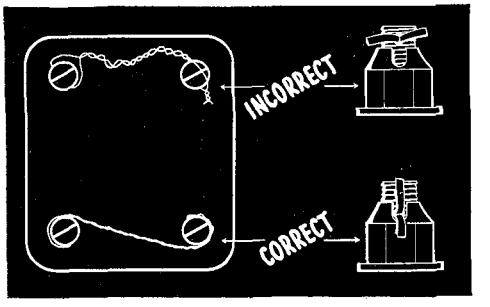
CORRECT: Separate the lines by using clamps or rawhide lacing. (Where a number of lines exist, a fibre block should be used to keep the lines separated and properly anchored.)



EXHAUST BOLTS

INCORRECT: Bolt improperly placed with head in downward position. If nut comes off, bolt works out and is lost; escaping flame causes damage.

CORRECT: Head of bolt placed in top position.



SAFETYING

INCORRECT: Safety wire too loose. Cotter keyhole too high above castellation of nut (When incorrectly safetied, screws will work loose; accessories will move around, shear bolt and cause damage.)

CORRECT: Safetying should be in direction of tightening; wire should be taut. Cotter keyhole should be well down in castellation of nut.

How To Keep Well

(Continued from Page 16)

warmed gradually. If it is the face, place the palm of the hand over the area for a few minutes; if the hand, put it inside the shirt under the armpit; or, if the feet, do like the Russians do, and put it under a companion's shirt. If the warmth does not return and the numbness disappear in a short time, medical treatment is necessary.

In case a doctor is not available, the patient should be taken into a cool room, and the heat of the room gradually increased. If lukewarm water is available, place the frozen limb in it, or, in case of a frostbitten face, make a compress of lukewarm water and apply to the area. All tight clothing should be loosened, and the injured person given warm food and drink. Do not rub the frozen area; but it is advantageous to gently massage the skin about the area in order to stimulate circulation. If the skin becomes black and blisters form, treat them like burns until the patient can be taken to a medical officer.

ANOTHER injury due to the cold that is common in Alaska is trench foot. This is the name given to a condition that results from prolonged standing in cold water or mud, or wearing wet socks and boots. Mild cases are sometimes called chilblains. This condition is most common when the temperature is near freezing (32° F), so that, in Alaska, it usually occurs in the spring or the fall of the year, when there is slush and mud. If care is taken to keep the feet dry, either by wearing waterproof shoes, avoiding mud and water or changing wet socks and shoes at frequent intervals, this condition can be avoided.

The uninitiated should be warned that the skin will stick to cold metal. This is especially important to those that use tools, guns, whistles and the like. The lip, tongue and hands are the most frequently affected parts. The skin freezes when it comes in contact with the metal object, and the only way that it can be released without tearing the skin is to heat the metal. Be careful in this act, otherwise a serious burn or scald may result.

Although Alaska is thought of as a dark, blizzardy country by many people, the sun can account for several painful injuries, even during the winter time. Sunlight reflected from snow, ice or water rapidly produces a sunburn, even in the Arctic. This will not occur during the middle of the winter, since the sun is below the horizon. However, it can occur in spring, summer and fall.

Snow-blindness is another injury due to the sun that can occur when the sun is shining. It usually occurs when there is a slight overcast, and is most common in flat country, especially in areas devoid of any vegetation. It is caused by the reflection of light from snow or ice, and usually begins with a slight blurring of vision. This blurring gradually increases and eventually there is smarting and then severe burning pain. The eyes become red and swollen. Finally, because of the extreme discomfort caused by the glare of the sun, the sufferer must cover his eyes.

This condition is not permanent, but the sufferer is helpless for several days. Once having had snow-blindness, the individual will be more susceptible to further attacks. It can be prevented by wearing pigmented glasses, or, if none are available, by covering the eyes with a scarf and looking through the holes between the yarn. The Eskimo makes goggles of wood or hide with a small slit to look through. Cold compresses of snow, ice, water or strong tea will give some relief but should not be used if there is any danger of freezing. Bandages which exclude all light will have to be worn for several days.

Snow-blindness does not occur among aircraft personnel while flying, but bright Arctic light does produce considerable eyestrain, so dark glasses should be worn always.

It is important to know how to care for and use Arctic clothing, for it is only by constant care and realization of the limitations of the various articles that they will be capable of protecting the wearer from the cold. The basic principle of Arctic clothing is to have a semi-airtight, preferably waterproof, outer garment and several inner wool garments. Wool absorbs perspiration, and since even during the coldest weather exertion is accompanied by sweating, it is necessary to have clothing that absorbs moisture. The outer garments should either be opened or removed during exercise to prevent overheating and to allow air to circulate freely and thus remove the vapor of perspiration. Socks and clothing, wet either because of perspiration, immersion or melted snow, should be removed as soon as possible, otherwise the wearer is apt to become chilled.

SNOW should always be brushed off clothing or it will melt and wet the garments, destroying their ability to retain heat. Tight clothing should not be worn. Shoes that are too small, too many socks and use of straps and leggings all cut off the circulation and thus tend to increase the chance of freezing. When shoes get wet they should be dried out by hanging near the ceiling of a heated building or tent with the other damp clothing. If they are placed near a fire, they will lose their oil, crack and become stiff. Sleeping bags should be aired out every day.

Men wounded in battle in the Arctic are very susceptible to frostbite. They are usually perspiring profusely while engaged in combat and when they fall they become chilled. They lose bodily heat rapidly due to shock, blood loss and direct contact with the cold ground. They should be placed in a warm spot as soon as possible, in a sleeping bag if a building is not available. Snow should be brushed off the clothing of the wounded before placing them in sleeping bags, otherwise it will melt and cause further discomfort and chilling. Wounded men should receive hot drinks as soon as possible. ☆

Forced Landing In The Arctic

IN THE Arctic the careful airman always makes sure that all emergency equipment and rations are on the airplane before he takes off, even if he is starting out on just a short hop. He may be forced down within a few minutes flying time of camp, but on the other side of a mountain range or in an uninhabited area from which it may take days of hard walking to get back to the base.

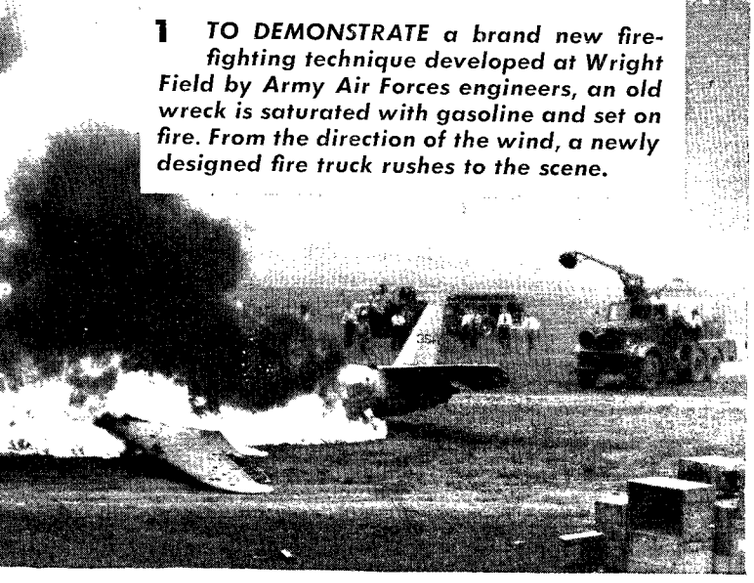
If forced down, stay in the vicinity of the plane until you are sure that the search for you has been called off. Smoke can be seen for great distances in the north; if nothing else is available, pour oil on rags and make a smudge of them. Set out panels of metal or cloth so they can be noticed by an airplane. Lampblack, powdered aluminum or other paints may be carried in the ship to be spread out on snow or water to attract attention. Tracks filled with green branches are also good. Designs should be 200 feet long to be readily visible from the air.

Make a shelter from airplane parts, or a tent from your parachute. An excellent pack-sack can be fastened from your parachute harness and ropes. Snow shoes and sleds can be made from engine cowlings, inspection panels and doors. The inner tubes of the tires may be removed and taken along to use as a raft if a collapsible boat is not among the equipment. All of these tasks will not only keep your mind occupied, but will also keep you moving about and warm, as well as prepare you for any eventuality if you are going to have to make your own way back to camp.

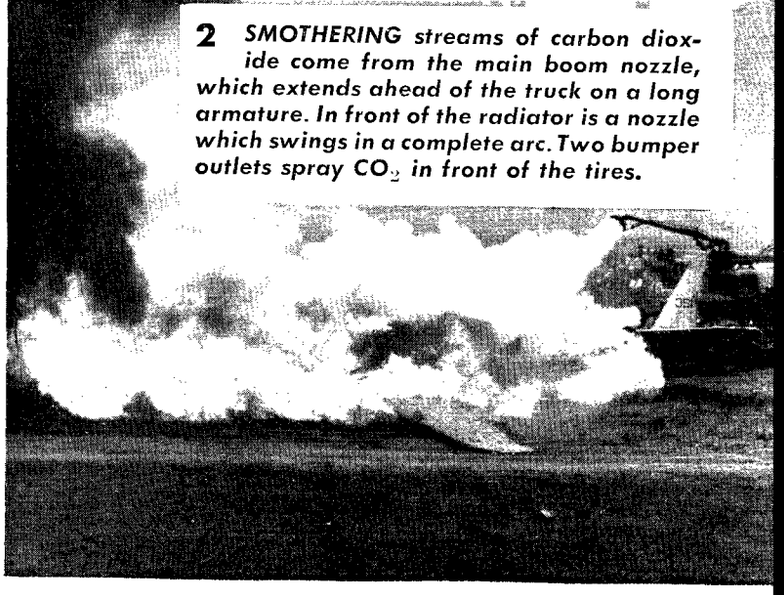
When you are absolutely sure that the search for you has been given up, select the things that you will need and start out on a definite course. The parachute can be used as a tent, windbreak or shawl. So do not discard any flying clothes; you may need extra clothing to replace worn out equipment, or as a change if you get wet. If there are any containers, take along some of the motor oil for use as fuel for cooking or as a lamp. Take along your Very pistol; it may come in handy for signalling if you sight a plane or ship. In summer be sure that you have the mosquito net or insects will cause great discomfort.

Start your journey in the morning. Walk slowly with frequent rests. If the snow is deep or the going is hard you must take your time or you will become exhausted and freeze to death. Take time to prepare at least two cooked meals a day. If lost, follow a stream or the coast and you will have a better chance of reaching a habitation. Cold, hunger and fatigue will be your principal problems, so prepare yourself to combat them before you leave the airplane, and develop a sense of resourcefulness as you go along.

(Continued on Page 39)



1 *TO DEMONSTRATE a brand new fire-fighting technique developed at Wright Field by Army Air Forces engineers, an old wreck is saturated with gasoline and set on fire. From the direction of the wind, a newly designed fire truck rushes to the scene.*



2 *SMOTHERING streams of carbon dioxide come from the main boom nozzle, which extends ahead of the truck on a long armature. In front of the radiator is a nozzle which swings in a complete arc. Two bumper outlets spray CO_2 in front of the tires.*

Fire-Fighting Crash Truck Keeps 'Em Flying

By Pvt. Andrew T. Rolfe

"ONE pound saved equals four more bullets enough to save a bomber- -so keep it super simple," is a motto that confronts the engineers of Wright Field Equipment Laboratory's Miscellaneous Unit. A poster bearing this motto, the inspiration of Colonel Rudolph Fink, hangs on the wall of his office. Each newcomer to Colonel Fink's domain has this thought driven home to him before his assignment orders have rested five minutes on his new commanding officer's desk.

A recent life-saving development announced by the Equipment Laboratory is a new fire-fighting crash truck which smothers the flames of a burning plane in less than three minutes with thousands of pounds of carbon dioxide. This fire-fighting marvel appears to be a far cry from Colonel Fink's motto. However, it owes its success to the constant work of civilian engineer W. E. (Bill) Huffman, who ever since he resigned his first lieutenant's commission in 1920 as a dirigible pilot in the Army Air Corps, has devoted his time to aeronautical research at Wright Field—especially to making CO_2 containers light enough to be carried in aircraft.

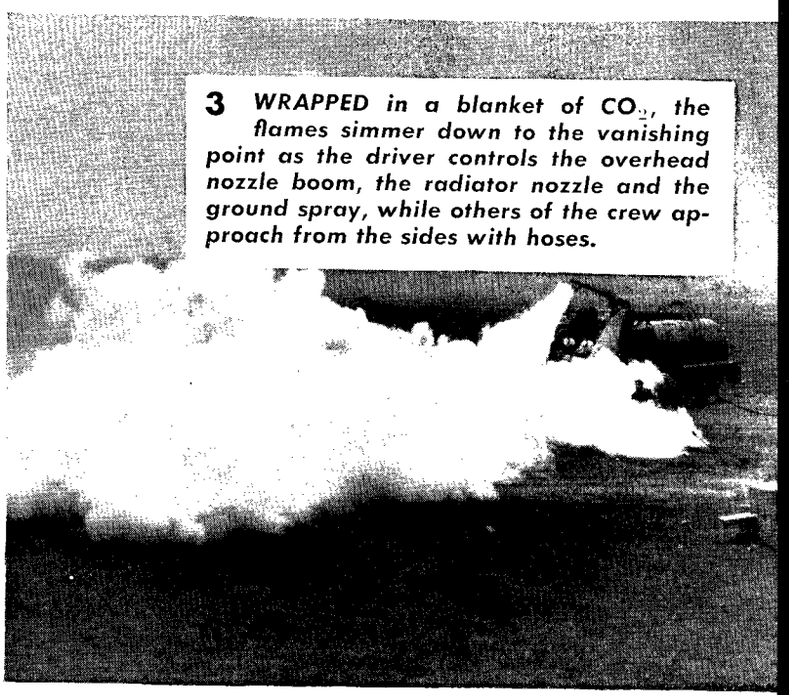
Huffman is the man who made the effective manually controlled engine-nacelle, carbon-dioxide cylinders which, since 1928, have extinguished many an airplane fire at a familiar source — the engine. His valves which stopped the old problem of having ice form in the neck by means of a constant speed control are now serving to inflate life rafts as well as putting out fires.

What has lightness got to do with a CO_2 carrying crash truck? The answer is plenty! To carry carbon dioxide in the amount needed to extinguish the flames of a crashed plane in the ordinary manner would mean that the Air Forces ground transportation engineer, Lieutenant J. C. Scott, would have to design a chassis of such gigantic proportions that the truck would be an awkward tractor-like contraption. Its lack of speed would impair its efficiency.

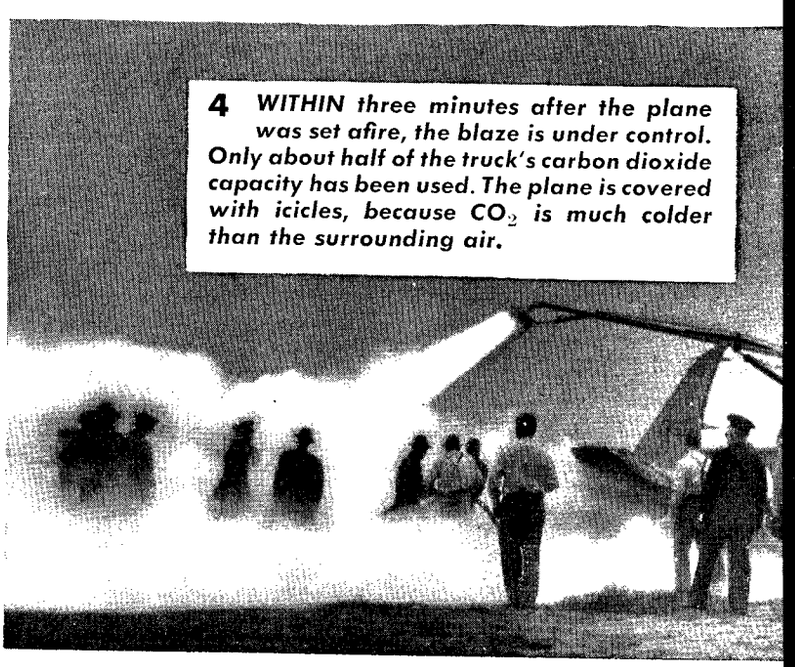
When Colonel Fink conceived the idea of a crash truck carrying enough CO_2 to extinguish a fire enveloping a plane, Huffman was ready to answer Lieutenant Scott's demand that the tank be light.

Working with the industry, Huffman found a way of keeping thousands of pounds of CO_2 at low pressure by refrigeration, thereby eliminating the necessity of a heavy pressure resisting tank.

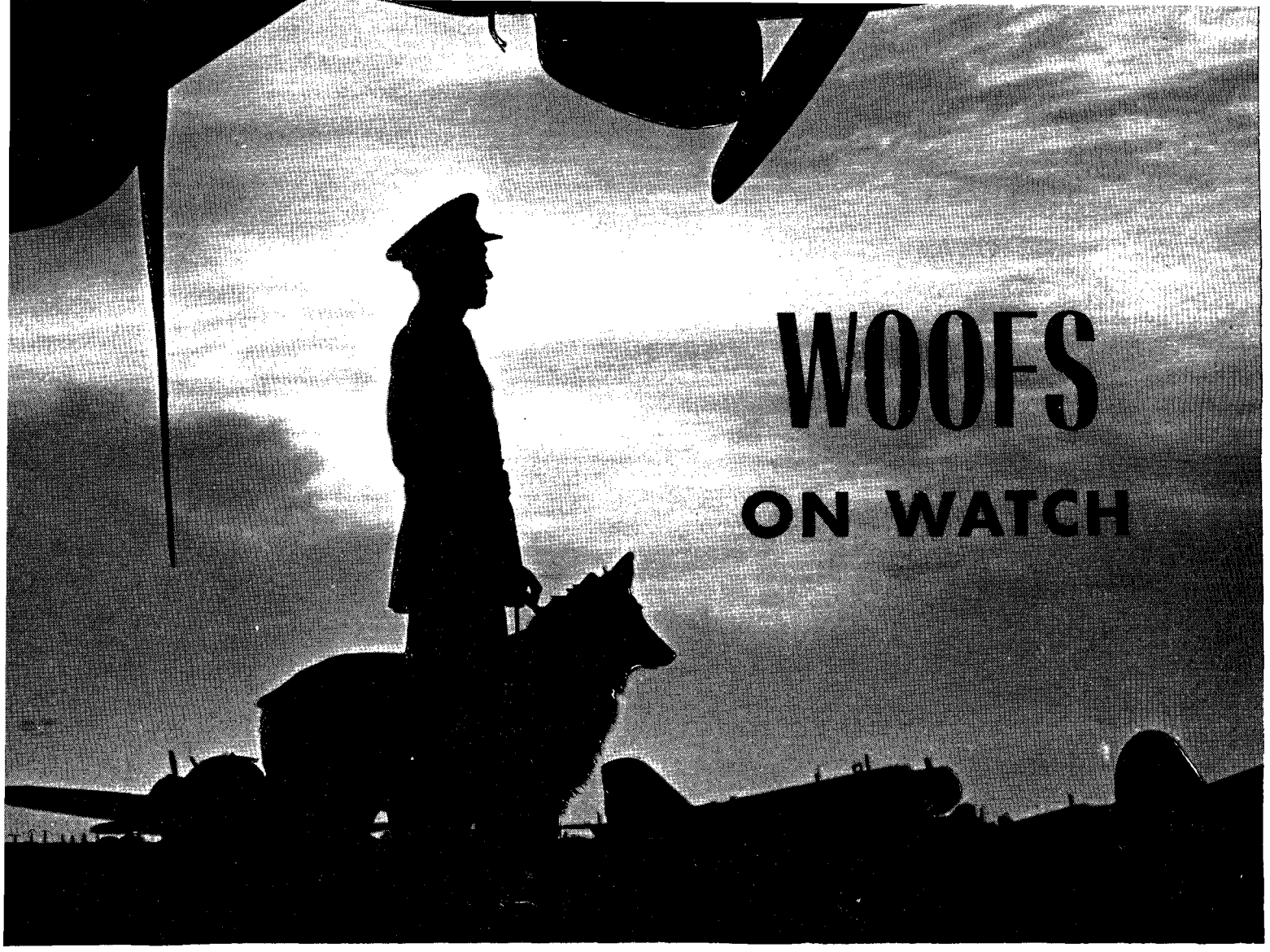
As a result of this research, the Air Forces now has a fast crash truck which can speedily reach the scene of a burning plane and put out the fire in a matter of moments. The prime purpose of this newest piece of fire-fighting equipment is to save lives. Salvage of the plane is secondary.



3 *WRAPPED in a blanket of CO_2, the flames simmer down to the vanishing point as the driver controls the overhead nozzle boom, the radiator nozzle and the ground spray, while others of the crew approach from the sides with hoses.*



4 *WITHIN three minutes after the plane was set afire, the blaze is under control. Only about half of the truck's carbon dioxide capacity has been used. The plane is covered with icicles, because CO_2 is much colder than the surrounding air.*



WOOFS ON WATCH

By Lieut. Harry P. Kelliher

MITCHEL FIELD

MEMBERS of the WOOFS, also known as the WAGS, a new and very doggy branch of the Air Forces, have completed their basic guard training at Mitchel Field, New York, and now take their places alongside soldier-sentries to keep the secrets of this base from prying eyes.

From seven at night till seven in the morning, in all kinds of weather, these highly-trained dogs keep watch at their designated posts; and they can become "man's worst enemy" when the necessity arises.

The duties of the sentry dogs are to accompany a guard on post; to act as an extra pair of eyes and ears; to give warning at a sign of danger or the suspicion of an intruder; but to attack only on command. The dogs are particularly useful in isolated areas and where vision is restricted.

Sentry dogs are real MP's, being carried as such on the roster, and have service records of their own. They also draw rations, just like any soldier.

A number of these animals are at present on active duty at Mitchel Field. This group includes Doberman Pinschers, who have a high reputation as military dogs, Boxers, Collies, French Poodles and one Kerry Blue.

The job of selecting and giving the dogs their elementary training is handled by Dogs for Defense, Inc., a non-profit organization, according to Army specifications. Medium-sized breeds have proved the most effective. They are big enough to bring down a man and more alert than larger breeds.

While military dogs have long been used as sentries by European armies (it is estimated that Axis nations are using more than 100,000 military dogs), these are among the first so trained in this country.

The task of training dogs and Mitchel Field sentries to work together is handled by Staff Sergeant Richard Farnham, who has trained dogs and horses most of his life.

"This could be called a post-graduate course for dogs," Sergeant Farnham explains. "After the animals have thoroughly learned to execute the primary commands such as to heel, sit, lie down, stay, leap over obstacles, sound the alarm, charge and release the victim, strict obedience to the individual guard with which they work must be taught or the dogs will become a menace.

"Selection of the guards who work with the dogs is highly important," the Sergeant states. "Each dog is schooled with the minimum number of guards. Gaining the dog's full confidence is a prime requisite; men who are sympathetic to dogs must be found. These are working dogs, not pets, and no one else is permitted to make friends with them."

The Sergeant says that too often a well-meaning soldier will come up to the dog while on sentry duty to pat his head and make friends. The guard warns him but the reply usually is, "Don't be silly; I've handled dogs all my life, they know me." A couple of vicious snarls or a lunge changes the well-meaning soldier's mind.

The training method used is the "teasing" process. The "teaser" is the man who acts as intruder while the guard and dog practice.

Proof that the dogs are completely acquainted with what they are supposed to do is shown by the fact that the Sergeant, who has trained them, does not dare approach a post they are guarding unless the sentry-partner gives the OK. ☆

COMPRESSIBILITY

An Introduction to Aviation's "Bugaboo"

By Colonel Ben S. Kelsey

PRODUCTION DIVISION, WRIGHT FIELD

MEET compressibility—the now notorious "bugaboo" of aviation.

The semi-mysterious characteristics of this plain and simple physical phenomenon have all but placed it in a class with Gremlins and other mystical figures which are supposed to furnish airmen with embarrassing moments. Actually, compressibility has been with us since the earth was first surrounded by a layer of air. Those concerned with bullet design and acoustics have long been familiar with it, but compressibility didn't mean much to airmen until they attained speeds of 500 to 700 miles per hour, or close to the speed of sound.

There are all sorts of discussions on the subject of compressibility, varying from the pilot's barracks flying to expressions of learned scientists representing the most advanced thought of research laboratories. It would be impossible to discuss all the phases of the phenomenon, since a great deal of the region of flight concerning compressibility is still unexplored. But enough is now known about compressibility and its effects to remove much of the danger connected with it, and certainly enough to explain its character.

Compressibility, as it pertains to aviation, naturally divides itself into three phases. The first of these is a simple physical description of shock waves, their formation and character. This phase, in simple terms, is the nature and formation of sound as discussed in any elementary physics text book, and the similarity of shock waves and sound waves.

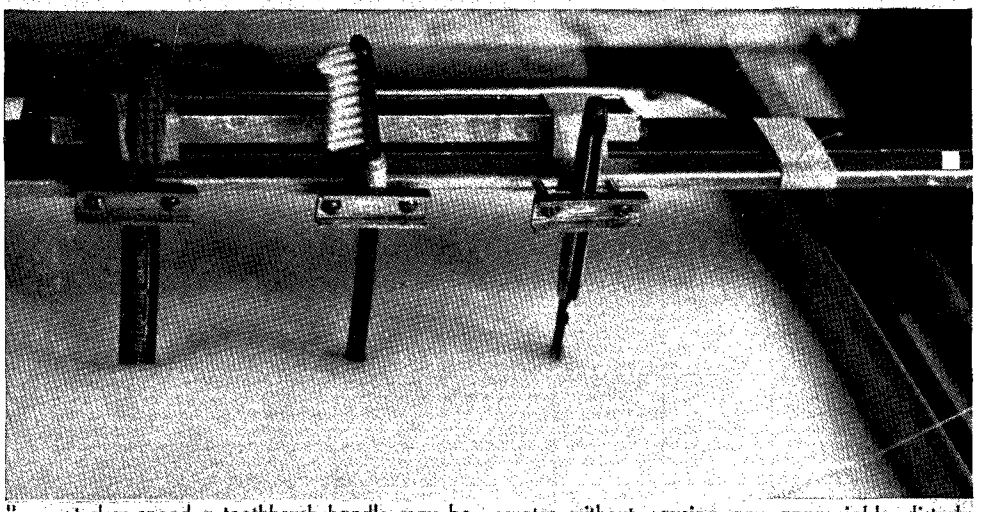
The second phase is logically the effect on an airplane in flight as it would be observed by the pilot; this phase concerns itself with the physical reaction of the airplane to the formation of shock waves.

The third phase involves a discussion of the problem which confronts the research scientist and the airplane engineer; namely, how to forestall, delay or overcome the compressibility effect.

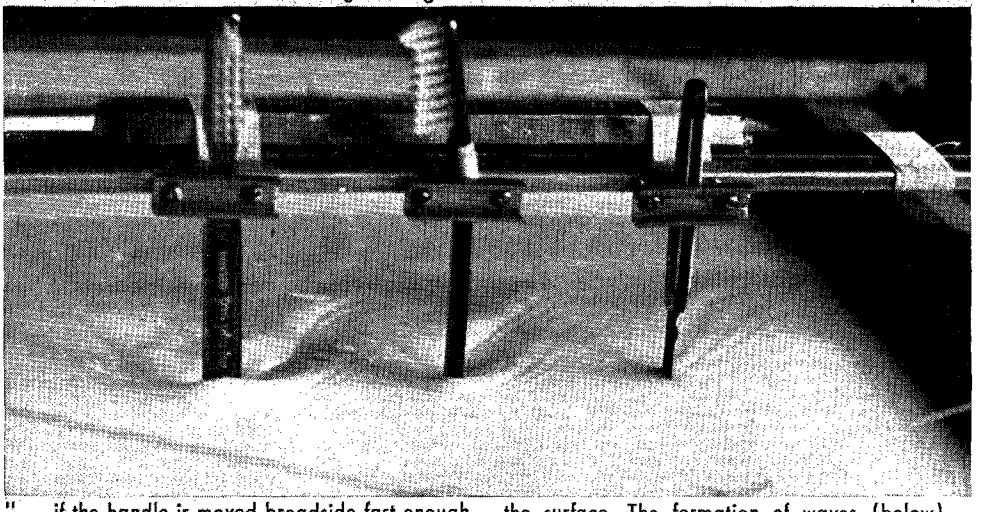
The entire problem of compressibility arises because of a peculiar characteristic of the air which causes sound to be transmitted through it at a definite speed. This characteristic of air is its ability to transmit waves.

We know that sound originates with vibrations and that these vibrations are transmitted somehow or other through the air, with the result that a corresponding vibration takes place when the sound wave strikes our eardrum.

One can experience both objects and waves traveling together through the air at the same time. For example, standing on the cliffs of Dover we could watch the big German guns across the channel throw shells over to our side. After seeing the flash, we could count one minute and about fifteen seconds before the shell arrived. The explosion of the shell on our side would occur just a little ahead of the sound of firing—how much ahead depending on how close it hit. It is obvious that the shell traveled through the air (Continued on next page)



". . . at slow speed a toothbrush handle may be moved with the thin or broadside edge cutting the water without causing any appreciable disturbance. This illustrates motions below critical speed."



". . . if the handle is moved broadside fast enough to create waves (above), the speed at which wave formations start is a little less than is needed when the handle is moved with the narrow edge cutting the surface. The formation of waves (below) obviously is a function of how much and how fast the water has to flow in order to get around the object. The same conditions exist in the air."

COMPRESSIBILITY

(Continued from Page 25)

faster than the sound waves caused by the blast of firing. Modern fighter airplanes can reach speeds, particularly when diving, that are comparable to the speed of shells and bullets. Bullets have long been traveling in this region of high speed above the borders of compressibility and have long been forming shock waves; we are fairly well acquainted with the pictures of shock waves which form at the nose of bullets traveling through air.

In high school physics we learned that sound waves travel like the ripples spreading out on a pool of water which has been disturbed by a stone dropped into the pool. We may have also learned that the vibrations causing sound waves actually compress the air in pulsations which transmit a series of waves; but instead of the sound waves moving a surface up and down as do water waves, the crests of sound waves are regions of compressed air (hence the term "compressibility") and the hollows are regions of reduced pressure. But the air itself does not flow with the wave any more than water flows with its surface waves.

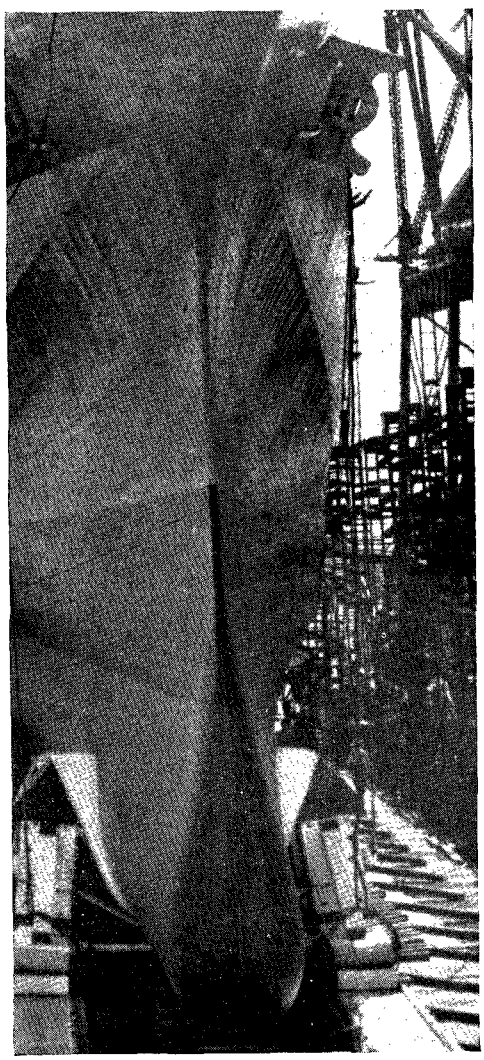
Having learned this in physics, we are in a fair way to understand that sound waves and shock waves are of the same breed. We probably all remember that the "speed of sound" was supposed to vary and was faster in solids and liquids than it was in air. We may have learned that the speed of sound in "standard" air is 1,090 feet per second, and that this represents the normal speed of transmission of the sound vibration. Actually, this is the speed of movement of the *wave*. Perhaps you did not realize that the speed of sound, even in air, varies under different conditions—varying primarily with the temperature. The speed drops with a decrease in temperature to the extent that in flight at high altitudes where the temperature is low a considerable reduction in this critical speed is reached.

THE well-known illustrations of the travel of sound in air serve to show that the speed of sound is not so very high, and that it is a very real factor. Many of us have waited for the sound to reach us after watching someone across the street strike a drill with a sledge hammer. Or we may have counted the number of seconds following a flash of lightning until we heard the thunder. We know that if we divide the seconds (between the lightning flash and the sound of the thunder) by five, we get the approximate distance in miles to the flash itself.

If we could move along through the air at the same speed as a sound wave it might seem as if we were riding the crest, or the hollow, or were in the midst of a pattern of waves similar to those around a boat. Perhaps it would be better to consider making our own disturbance or shock wave just as a boat creates the waves that move with it. In this event, these sound waves or shock waves—which are actually areas of bunched-up and thinned-out air—would stay with us, and if we could see them they might appear as definite as the waves on the surface of the water.

At speeds below that of sound, the air can move out of the way and can close in behind an airfoil without any appreciable compression or formation of a wave. At speeds above that of sound it might even be possible to move out ahead of the wave, leaving it behind, but we should still be concerned with the formation of the wave. Speeds above the speed of sound are relatively unknown except as applied to bullets and propeller tips.

In order to see these shock waves it is possible to take advantage of the variation in light refraction of the alternate regions of compressed and rarified air since the variation in light refraction causes light passing through to bunch up and produce bands of light and shadow when exposed photographically. We are familiar with photographs of these waves formed on bullets, and there are a number of such illustrations applying to airplanes and aerodynamic shapes. For the most part, however, it is necessary to imagine what occurs, or to use familiar illustrations which may not be, strictly speaking, scientifically accurate.



The sharp edge at the water line of our modern freighters, combined with a bulbous nose below the water line, serve to control the formation of the waves, thus saving power to put into speed.

A fairly complete study in compressibility can be made with a toothbrush and a bowl full of water. If the handle of the toothbrush is moved through the water at slow speed, the handle may be moved with the thin edge of the broadside cutting the water without causing any appreciable disturbance. In other words, at low speeds the water is able to move out of the way and back in behind the handle without creating waves. This illustrates motions below so-called critical speed.

HOWEVER, if the toothbrush handle is moved broadside fast enough to create waves, the speed at which wave formations start is perhaps a little less than is needed to create waves when the handle is moved with the narrow edge cutting the surface. This illustrates the fact that the critical speed depends upon the displacement, or the necessity for rapid recovery or flow-back-in after the passage of the handle.

It is obvious that a thin knife blade could move at a still higher speed than the toothbrush, but the surprising thing is that at one speed a knife cuts through with no ripple at all and then suddenly, with almost no increase in speed, a big wave formation sets up. Old Critical Speed himself pops up with a vengeance.

The formation of waves obviously is a function of how much and how fast the water has to flow in order to get around the object. The same conditions exist in the air, but, of course, at a much higher speed, simply because the air is lighter and can be pushed around with less effort.

It takes work to make waves. This can't be measured easily with a toothbrush handle but anyone who has ever stood in a row boat and rocked the boat to make waves knows that he can get tired just making waves without going any place. The effort required to move a boat is expended partially in overcoming the friction of the water on the bottom as it slides by, and partially in making waves. A well-known principle in crew racing is that the crew which bounces the boat up and down, making the most waves, invariably loses to the crew with the smoothest stroke. One has only to look at the bow wave of a blunt nosed freighter to realize that it must take a great amount of coal or oil to shovel that much water across the ocean. We are familiar with the bow-shape of our modern high-speed vessels with a relative knife edge at the water line and a more rounded and blunt nose built below the water line. This is to control wave formation and save power to put into speed.

The air, as we normally think of it at rest, is a rather docile medium. We know that we can walk through it without having to work very much to overcome simple air resistance at low speeds. We also know that as we increase our speed through the air we increase the amount of work required to shove aside the air and slip through it. When we reach the mysterious "speed of sound"

(Continued on Page 36)

"PHYLLIS HAD THE STUFF . . . "

(Continued from Page 7)

We were in Vee of Vees all the way in to the target. The main formation was in Vees, and we, who were in the "rear guard," were in echelon of Vees, from left to right, inside the rear wings of the main formation. Our ship was "Tail-end Charlie." We were the rearmost left-hand ship in the formation, and hence the last to bomb.

WE HIT scattered heavy (high altitude) "flak" on our way in, but it was slight, and did no harm. We got well over our targets, in formation and unmolested, when I heard the bombardier yell through the inter-phone, "Bomb doors open!--Left!—Right a bit!—Right hard!—Right, damn it! Right!"

I kept trying to follow his directions. It was tough because we were in the slip-streams of the ships ahead and it took a lot of rudder to keep Phyllis on the course he wanted. At last he said "Okay! Bombs away! Button her up!", which meant for me to get the bomb doors closed. Then he said "HIT-HIT-HIT on target!" It sounded fine.

The bombing part was easy. We'd got over the target and dropped them on the nose—by the grace of Lieutenant Komarek. All we had to do now was get back.

But that's when they started to pour it on. The open bomb doors had slowed us down a lot, and we were behind the formation. The German's strategy was obviously to pick on the last ship and shoot it down.

Most of the others got no attention at all from them. And I might say that I think it would be a lot better if the last ships in a formation were to slow down momentarily and let "Tail-end Charlie" get his bomb doors closed and catch up before they high-tail for home. You can get a lot of inter-protection from even two other B-17's. And we certainly needed it right then.

But there we were. Behind the others, pulling between 47 and 50 inches of mercury—a hell of a lot at that altitude—and trying to catch up, meanwhile taking evasive action. The flak was really being poured on. Heavy flak. I saw it below me, in front, and then above me. We were bracketed, and I knew that when it came next, they'd have us. They did. We started getting hits and plenty of them. I could feel the ship back and shudder each time they hit us. And I might say, incidentally, that one of the boys in the other ships saw them hit and destroy one of their own pursuits, an ME 109-G.

Things were happening fast, and it's a little hard to get them in their proper order. I'm trying to tell what occurred in about five seconds, but it's going to take a hell of a lot longer than that to do it. I was talking about their pursuits. I forgot to say that I had seen a dog-fight—or what looked like one—ahead and above me. Just a flash of it. That was when we were on the target.

Then came the flak, as I've said before. And then the hits. But after that came something worse. The flak suddenly stopped cold, and I knew we were in for it. That's the toughest moment of a bombing raid—the few seconds between the time the flak stops and the enemy pursuit comes at you. I found time to be scared, but not for long.

Just then all the gunners in the crew started calling through the interphone: "Enemy aircraft at three o'clock, Lieutenant! . . . At five o'clock! . . . At nine o'clock! . . ."

Sergeant Taucher, the rear gunner, was more specific. He yelled: "Hell, Lieutenant, they're coming in! From behind! There's a jillion of 'em! They look like pigeons!"

I said "Give 'em hell, boy!" or something like that.

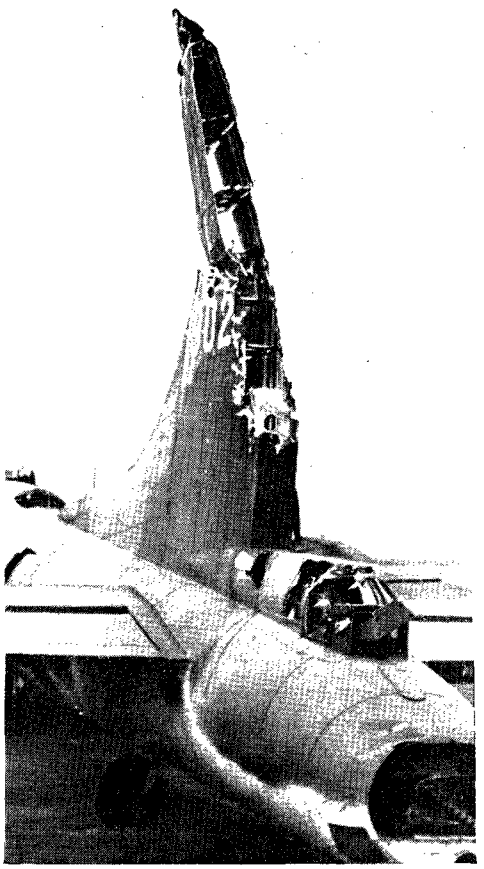
He said, "I can't. My guns are jammed. I'm trying to clear 'em!"

"Keep swinging them around so it looks like you're firing." I said.

"Okay, Skipper!" Then, "I've got one gun cleared now." He started firing.

HE TOLD me later that once he got his guns going he didn't take his finger off the trigger from the time their formation started to come in until the last ship of it had gone out. They were employing two tactics that were new to me—and damned effective. When they peeled off to attack, they came in so close together that by the time one ship had shot us up and banked away, the next in line had his sights on us.

The other dodge they used was to pretend to come in on one of the other ships, and then do a twenty-degree turn and shoot hell out of us. And while Taucher said their fire came mostly from a range of about 1,200 yards, he also said that they were so close when they *finished* firing that he could see their faces. Mostly they came from the rear, but at least one of them got up under us from in front, stalled, and, as it fell off, raked us the length of Phyllis' belly. I could feel his hits banging into her.



DESPITE a badly shot up rudder and tail assembly, this B-17—like Phyllis—also got back from a daylight raid over France.

As a matter of fact, I could feel the effect of all their fire. It was rather like sitting in the boiler of a hot water heater that was being rolled down a steep hill.

I began to realize that things were getting tough. There was an explosion behind me as a 20-mm. cannon shell banged into us just behind the upper turret and exploded; and I kept thinking, "What if it hit the flares?" If it hit the flares and ignited them I knew we'd go up like a rocket.

Then I looked out at the right wing and saw it was shot to hell. There were holes everywhere. A lot of them were 20-mm. cannon holes. They tear a hole in the skin you could shove a sheep through. The entire wing was just a damn bunch of holes.

I looked at Lieutenant Long, the co-pilot. That was a treat. There he was with his wheel shoved clear over to the right in a desperate looking right-hand turn which seemed, at the time, very funny because *my* control wheel was centered. I started to laugh and then decided there wasn't anything to laugh about. The position of his wheel meant his aileron control cables had been shot away. That wasn't funny at all.

About that time several other unpleasant things happened all at once. First, the waist gunner, Sergeant Peterson, yelled through the interphone: "Lieutenant, there's a bunch of control wires slapping me in the puss," which meant that the tail surface controls were being shot up. Second, the right-hand outboard engine "ran away" and the engine controls were messed up so we couldn't shut it off. Third, the left-hand inboard engine quit. And fourth, the ship went into a steep climb which I couldn't control.

I FORGOT to say that the whole left-hand oxygen system had gone out with the first burst of flak, and that I was trying to get the ship down to 20,000 feet to keep half my crew from passing out. I forgot to tell about this before because things were happening too fast to tell them all at once. Behind me there was a pretty nice little piece of drama going on that I couldn't see. My radio gunner, Sergeant Bouthellier, passed out from lack of oxygen, and the radio operator, Sergeant Parcells, seeing him lying by his gun, abandoned his own oxygen mask and put the emergency bottle over his face. Sergeant Bouthellier revived, just in time to see Sergeant Parcells pass out himself. He, in turn, took the emergency bottle off his own face, and revived Parcells. After that, on the verge of going out again, Bouthellier called through the interphone to tell me that the oxygen supply line was damaged. With Lieutenant Long's help I managed to

put the ship into a steep dive and leveled out at 20,000 feet. At this altitude, everyone could keep going without oxygen.

To return to the fourth unpleasant thing that happened—when Phyllis went into a steep climb I simply couldn't hold her level. There was something wrong with the controls. I had my knees against the wheel and the stabilizer control was in the full-down position. The control column kept trying to push me through the back of my seat. I motioned to Lieutenant Long to help me and between the two of us we managed to get it forward and assume normal level flight.

Then I started to think. The enemy fighters were still shooting us up, we had a long way to go to reach England and safety, we were minus two engines, and it took almost full left aileron to hold that damaged right wing up. It was clearly time to bail out of that aircraft. It seemed a funny idea, but I decided it was the only thing to do. So I yelled into the interphone: "Prepare to ditch!"

Then I started to call the roll. Everyone answered "Okay, Skipper!" except the top gunner, Sergeant Coburn. Sergeant Peterson was badly hurt, but he answered, "Okay, Skipper", and even had time to ask me if I was wounded. He said, "How's the ship, Lieutenant?" I said "Okay." He said, "On second thought, what I really want to know is 'How are you'?".

I MIGHT say right here that it was the finest bomber crew that ever took off. The whole gang was right on the nose. Everyone did his job every inch of the way. I'm the one who is telling the story, because I was the guy in command. But there were nine other men in Phyllis, and any of them could tell you a better story of what happened. Phyllis had it all right; but so did her gang.

But to get back to what happened. I gave the order to prepare to "ditch" ship, with visions of a German prison camp in my mind. But just about that time Sergeant Coburn, the top gunner, slid out of the top turret, and fell to a position between me and Co-pilot Long. Coburn's face was a mess. He was coughing blood and I thought he'd been wounded in the chest. It later proved that he wasn't, but he was clearly in no condition to bail out of an airplane.

Things were tough right then. They were still shooting at us and the coast of France was a long way away. Our target had been about 60 miles inland and with our reduced speed—two engines out of action—it would take us quite a while to get to the coast. I felt a little sick inside. I yelled through the interphone that anyone who wanted to could ditch right then and there. But no one wanted to. Phyllis was still "airborne," as the British say, and I guess by this time they trusted her. Meanwhile, the enemy pursuit kept pouring lead into us, and there's no evasive action worth a damn you can take when you are shot up the way we were.

Lieutenant Long left his controls and went back to give first-aid to Sergeant Coburn. Immediately, I had the problem on my hands of keeping Phyllis from climbing through the ceiling. The damned stick just wouldn't stay forward and I kept on gaining altitude. I called for help through the interphone, and I'm sure that everyone on that ship thought I was injured. Lieutenant Komarek tried to get up through the hatch to help me; but he couldn't because Lieutenant Long and Sergeant Coburn were on the door in the floor through which he'd have to come. I didn't dare throttle the engines, either, for fear we'd just quit flying. Phyllis, at this point, had a stalling speed of about 160 m.p.h., in spite of her ambitious climbing tendencies. So I just fought her.

Meanwhile, Coburn was doing his best to bleed to death. Throughout, however, he never lost consciousness, and he kept making funny remarks.

Finally, the radio operator, Sergeant Parcells, came forward and took over the first-aiding of Coburn, allowing Lieutenant Long to crawl back into the co-pilot's seat. Between us we got Phyllis under control.

We were over the Channel by that time and some British Spitfires took us in tow. The Jerry pursuit stuff gave up and departed for home. We went into a dive from 20,000 feet for anywhere on the coast of England.

The runaway engine gave us a lot of trouble. The electrical system was shot to hell, and we couldn't shut it off. Long tinkered with the fuel valve but no soap. I was afraid to tinker with the fuel valves. Finally we gave it up. Phyllis was still flying, and I didn't want to ask her too many questions.

We made a wheels-up landing at the first aerodrome we saw in England. We could only make left-hand turns because both Long and I knew that if we ever got that shop-up right wing down we could never pick it up again.

I buzzed the field once and scraped a chimney or two off some buildings at the end of the runway. I knew we were going to have to crash-land because the hydraulics were shot, and I couldn't get the wheels down. Besides, I didn't want to land Phyllis normally at 160 m.p.h. She'd have coasted clear across England.

So we belly-landed her. The long way of the runway and cross-wind. It was a damned fine landing—marred only by the fact that Coburn, the wounded man, kept making remarks about how tired he was of flying. Sarcastic remarks. I promised him that I'd put him on the ground and was lucky enough to do it in good shape. We all walked away from that landing. Belly-landing a B-17 is an art, and both Long and I agree we have mastered it. Sergeant Coburn agrees, too.

And next time anyone tells you a Fortress can't take it, give them the works. As one of the boys said after we got back: "Phyllis had the stuff." God rest her soul.

Oh, yes, Komarek, the bombardier, got sick after we landed. But he was considerate about it. He took off his flying helmet and used it as a receptacle so the kids that dismantled Phyllis wouldn't have to clean up after him. We all laughed like hell about that. ☆

THE BOYS WHO KEEP 'EM FRYIN'

By Pvt. Mort Weisinger

AN ARMY travels on its stomach, and to make certain that the stomach isn't lined with tough-as-leather beef cuts, the Army Air Forces are monthly graduating hundreds of student cooks from Baker and Cook schools throughout the nation. Culinary cadets who have never known a calorie from a vitamin are being taught literally to cook with gas.

For two months these white-clad "grease monkeys" ride the range of a stove, finally emerge qualified in the arts of stewing, sauteing, simmering, braising, fricasseeing, roasting and baking.

These captains of the chow go in for soldier-like strategy. The science of decoy is mastered, and student cooks learn how to bait appetites by garnishing dishes with a variety of colorful vegetables. A green pepper ring, the scarlet splash of paprika on a boiled potato, spinach's green complemented with the luring yellow of sliced egg — all these tricks from the Army's recipe to win appetites and keep its men well fed.

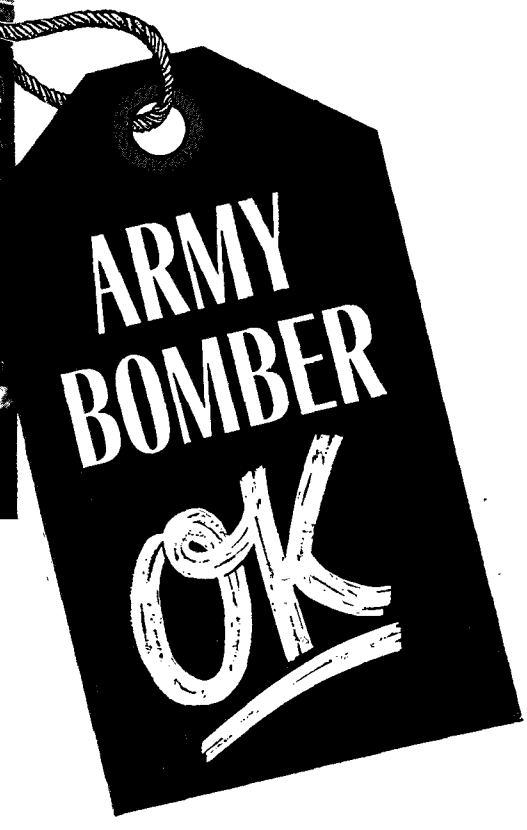
"When the menu calls for hamburger, and the men have had hamburger recently, I camouflage it", one alumnus cook told us recently. "I make chili con carne out of the meat, or make stuffed green pappers."

The business of salvage and the elimination of waste in the kitchen is also important. "When we have pancake batter left over from the morning's breakfast, we use the surplus batter to make corn fritters for dinner", this same chef told us. "And if the rice doesn't go over at dinner, we make a rich rice pudding out of it for supper", he added.

A graduate baker joined the conversation. "I've just had a two months' loaf (meat) on the government's dough", he flipped. He waved his diploma at us. "Honest", he said, "I'll make some girl a good wife. I can make biscuits, bread, pies, buns, and doughnuts."—*Atlantic City Beam.*

Here's how new B-17s are tested by the Army after they roll off Boeing's production line—on their way to the wars.

Capt. Hansen adjusts the controls of a B-17.



By Captain Harold R. Hansen

CHIEF, ARMY PRODUCTION ENGINEERING, BOEING AIRCRAFT COMPANY

WHEN a B-17 is wheeled off the Boeing production line, it undergoes two tests—a company test and an Army test.

These differ considerably.

The Boeing check-up is primarily functional. First, a company pilot and co-pilot take the ship up alone for a period of twenty to forty minutes. Cruising slowly at three to six thousand feet above Boeing Field, they carefully analyze the plane's performance in flight, making sure that props, engines and controls function properly.

After this, they land and pick up a crew of company electricians and mechanics. Then follows a flight of an hour or more, during which countless adjustments of regulators and equipment are made.

All irregularities and malfunctioning of equipment or accessories which cannot be corrected in flight are noted by the company pilot. These are then corrected by company ground mechanics and "signed off" by Army inspectors.

The B-17 is now turned over to the Army B-8 Inspection group. The term "B-8" comes from the number of the Materiel Center directive which requires a complete and very searching inspection of 428 individual items. In addition, the B-8 Group inspects about 150 more items which become accessible as cowling, panels and doors are removed to get at the 428 basic articles and assemblies.

Again discrepancies are noted which will be corrected by company mechanics and "signed-off" by Army inspectors.

The big bomber is now ready for the Army acceptance flight.

Another Air Corps man and I have been waiting in the Pre-Flight Flight Operations Office. Sling a chute over your shoulder, come along with us, and we will try to give you some idea of how this airplane is tested before it's sent off to the wars.

WE find a lot of traffic on the field. Seattle weather is unpredictable, with plenty of fog, but today is clear and the runway is warm with landings and take-offs.

Riding across the apron in a station wagon, the Boeing operations man hands me the company pilot's report. I ask him, "Which ship are we flying?"

Before we get into the ship, I very carefully read the Boeing flight report. Everything is reported in order.

Next, we examine cowlings, especially the outer sides, which cannot be viewed from the cockpit. The object is to see that no Dzus fasteners are loose. If they were, they might fly off and rip the devil out of wing or tail surfaces.

We look at the turbo intakes and landing gear to be sure no rocks or foreign matter clog them, and check the landing strut against hydraulic oil leaks. Along the way, we observe that the brake hose sets at a proper angle.

One propeller blade shows a nick, probably made by gravel. Where you find one, you will usually find more on other props. That's the case. The co-pilot makes a note on the flight inspection report to dress out all nicks.

Incidentally, we have two reports to write. One, the Flight Test Check Sheet, shows how thorough our examination of the airplane will be. Eleven items must be checked, as follows: (1) flight controls, (2) propellers, (3) radio equipment, (4) engine and turbo operation, (5) automatic flight equipment, (6) wing de-icers, (7) hydraulic system, (8) heaters and defrosters, (9) electrical system, (10) flight instruments, and (11) power turret operation.

The second sheet is the Pilot's Inspection Report, which is simply a memorandum of irregularities discovered on the flight, with corresponding spaces to be filled in by plant mechanics who will correct the faults and by inspectors who will approve the work.

Boarding the plane by the side door, our inspection continues as we move forward to the pilot's compartment.

The tail wheel strut? O.K. Miscellaneous equipment—is it all anchored down? Yes. While we have elbow room, we don our chutes and make certain they fit right. Moving into the radio *(Continued on next page)*

ARMY BOMBER—OK

(Continued from Page 29)

compartment, we run our eyes and our fingers over the wiring and check all instruments. Calibration correct.

Into the pilots' seats now and the first thing is to check the gas. The tanks are filled but the tiny gas warning light doesn't operate and we make a note to have it fixed.

On 1 . . . On 2 . . . On 3 . . . On 4—one after another the engines are started and, while they warm up, we call the control tower for taxi and take-off instructions.

Try the brakes. They hold but seem a bit too weak. A memorandum is made to tighten them. Next to be tested, in order, are prop governors, turbos, manifold pressure and RPM. Everything normal. For a minute or so, we run oil through the propellers at high pitch, so it will flow properly, and then test individually each magneto and each engine. Board instruments are carefully watched for inaccuracies and we make certain that the blue lights from which luminous dials and indicators reflect are in proper working order.

Strap into the seats now, for the plane is ready to take off. We taxi down to the far end of the runway. "Use all the runway you've got" is still one of the wisest slogans in the business.

ONCE in the air, we bank sharply over the ridge of hills that flanks Boeing Field on the east and, as we climb, all generators and batteries are checked. O.K.

The radio compass needle is wavering. We are above a radio station and, as we fly over, the needle swings exactly to 180 degrees. The marker beacon light is burning.

The snowy peak of Mount Ranier lies a few miles ahead as we cruise south at about 160 miles an hour. We won't fly higher than 6,000, probably, nor very fast. There's no point.

Tiny rivers of propeller de-icer fluid on the engine cowling show that it is flowing correctly and the rubber wing de-icers breathe in and out regularly, just as they should. Oil pressures and temperatures are both about right, as are the fuel pressures and cylinder head temperatures.

Now we *very carefully* trim the airplane for straight and level flight, paying particular attention to the ball in the bank and turn indicator. It is imperative that the B-17 be perfectly trimmed, or our automatic flight equipment—which we are now about to test—will not function properly. We then center the airplane, flying straight and level with hands and feet off the controls, and we extinguish the "tell-tale" lights by adjusting the aileron, rudder and elevator centering knobs, in the order named. As the "tell-tale" lights are extinguished each of the engaging switches are immediately thrown "on."

This is the most important part of our flight, from the Army's standpoint. Company pilots are not permitted to fly with secret equipment. Certain Boeing mechanics are trained on it, and one of them is along with us on this flight, riding in the bombardier's compartment, making any necessary adjustments. Few are needed. We bank at a 30 degree angle to the left and then to the right. The plane levels out smoothly each time.

This automatic equipment, like many other things, will require adjustment in the field, of course. But it is our job to be sure it's right to start with—that, above all, there is no faulty gyro.

While we have the airplane flying on the A.F.C.E., we put it into a bank to the left and then to the right to such a degree that the bank and turn indicator is registering a one-needle-width turn. We now check the amount of turn for 120 seconds; if the rate is not three degrees per second the bank and turn indicator must be replaced and readjusted.

Taking the controls again, we feather the props and stop the engines. One after another they are switched off, until we are flying on various combinations of three engines, then two engines, and finally on just two engines of either wing. The plane performs well under all circumstances.

Our flight is just about over. We have been gone 30 or 40 minutes, checked all vital controls, instruments and equipment. There are six irregularities, all of which have been noted on our inspection report. They are minor, however, and the airplane will not have to be test-flown again. It will merely go back to the plant for correction of the minor flaws and further inspection. Had we found a major irregularity, the ship would be taken up once more.

But Number 53 is in good shape. In a day or two at most it will be ferried away by a pilot of the Air Transport Command. Later, perhaps, it will be assigned to you. ☆

Americans Can Still Shoot

A TALL man with Captain's bars on his shoulder watches closely as the gunners aim and fire at clay pigeons. Now and then there's a slight lull in the proceedings and he slips a shell in his own gun and calls "Pull!"

A bird sails out. It breaks into bits with the Captain's shot, despite the fact that he hasn't bothered to raise the gun to his shoulder. From his position 25 feet behind the trap the Captain has shot from the hip.

This is Captain Phil Miller, one of the best trap shots in America, now technical advisor in charge of all shotgun ranges at the Army Air Forces oldest Flexible Gunnery School at Las Vegas, Nevada.

Captain Miller has been shooting and teaching others to shoot for more than 30 years. He won his first major trap shoot in 1915 and then for a decade walked off with practically every shooting award in both professional and amateur competition. Then in 1925 he decided to retire.

But nine years later Captain Miller came back. At the Grand American in 1934 he broke the first 200 straight. In 1937 he won the Amateur Clay Target Championship and a year later the National High Average Title. In 1939 he won the Grand American all-round Championship and was named captain of the All-American team. At Las Vegas, the Captain is somewhat surprised but nonetheless pleased to see that recurrent phenomenon, The American Eye, in action. "There must be something in our blood," he says. "Even after a generation of city life our boys have not forgotten how to use a gun. We're closer than we think to the pioneers."

Captain Miller finds that there is no class or region which holds a monopoly on the tradition of the shot gun. Generally speaking, of course, country boys take to training more readily. Captain Miller tells of a Georgia private who had never seen a trap in his life before he walked on the Las Vegas range. He promptly broke 50 out of 50. The answer? He had been shooting rabbits "down home" as long as he could remember.

Conversely, the Captain counters with the story of a Boston city slicker who beat the pants off a Virginia duck hunter. They come from everywhere. A piano player, the Captain discovered, makes a first class gunner. So do billiard experts and golfers. Anyone whose eye and hand are already accustomed to functioning together knows what to do with a trigger and a target, Captain Miller has found.

The trap and skeet ranges are an integral part of the aerial gunnery training course at Las Vegas—a course which manages to combine the best elements of a sweat shop and a university. The Captain, at 49, has been through the entire gunnery schooling, from the first classroom lecture to the final phase —plane-to-plane firing. He has a diploma which states that he is a qualified aerial gunner. And he has gunner's wings.

Captain Miller has very little time for relaxation, but occasionally on Sundays he gets a few hours off. That is the time when he does what he enjoys most: He rounds up a couple of other officers and together they visit the trap ranges to—you guessed it—"kill" a few clay pigeons. ☆

was acquired while hauling freight above the Burma Road across the Himalayas from India into China and return in a C-47 transport. He has very definite ideas about that one.

The second impression which can be related safely is that three rupees was too much to pay for the baby King cobra he bought to bring back as a pet. Under the fakir's persuasion, the baby snake proved that it could raise a good part of its 10-inch length, flare its hood and strike. But its body was almost transparent. Captain Laird's suspicion that it lacked guts was confirmed when the snake died at altitude over the South Atlantic in a Clipper.

Like many critical operations at Army Air Force outposts, the job of lugging freight over the hump was never a joy ride. The heavily-laden C-47s, in the hands of airline pilots who had been hurriedly recalled to active duty in March for this express assignment, often accomplished the impossible. Or so it seemed to the Japs in Nakajima 96s, armed fighters with a speed of 270 miles per hour at 17,000 feet.

By any comparison on paper or in the air, the Japs should have had a field day. Armed only with tommy guns, the converted DC-3s cruised at about 140 miles per hour. The route was too long for fighter escort. Interception from the Jap's base, within easy striking distance across the Burma border, should have been a military certainty.

"From our base in India, a series of 12,000 and 14,000-foot peaks stretched northeastward toward China," Captain Laird explains. "Out there, they call them either the HiMALayas or the HimaLAYas. Off to the left the peaks reach 22,000 feet. Between these jagged upturned fingers are valleys with sheer rock sides through which the Japs, up until the date of Captain Laird's departure, had not bagged a single Burma Roadster C-47. His explanation for this embarrassing score pays tribute to the Chinese.

Although they were always in there trying,

"Our real protection," he reports, "other than plenty of bad weather, was the best air raid warning system in the world, in my opinion. It's uncanny how those Chinese men and women—and even the children—detected and reported Jap planes over Chinese territory. They were always on the job and had lots of short wave radios.

"Their warnings constantly kept us informed where the Japs were flying, how many and what kind. This gave us time to duck into the clouds, or in clear weather to drop down into a valley and circle until the 'all clear' came, hoping that we wouldn't be spotted. Lacking the speed to run away from

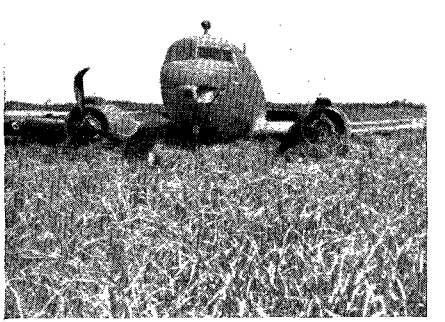
Laird recalls, "when we got a warning that a formation of 18 bi-motored Jap bombers with a fighter cover was 40 miles away. There was a broken overcast, not enough for good cover. So I dropped down into a valley and circled for the better part of an hour. Suddenly, through the haze, a plane, followed by another, pulled up over the lip of the next valley and scared hell out of me. I pulled away, heading for my destination and expecting company at any moment. I heard two AVG's talking to each other, something about 'that Number 37 is mighty lucky. He was hiding down there in a valley while 20 Japs were setting 4,000 feet above but they didn't even spot him.'

"Thirty-seven happened to be the number of our plane.

"Back at our destination, I learned that the two planes which had come at us from the next valley were two of our cargo ships which neither the Japs nor the AVG's had seen. Little wonder that the Burma Roadsters believe they owe their lives to the alertness of the Chinese."

All in the Life of Burma Road Cargo Pilots

IN THE early months of war they kept the Road open by dodging Japs and flying freight in C-47 transports. Ground transport (below) . . . on downhill dunes, it fairly flew. In the Far East planes make camel transportation like this look just as slow—well, just as slow as it looks. Now and then, as pictured below, overloads and short runways had this effect. But parts were borrowed from another plane so this one could proceed to India.



Technique

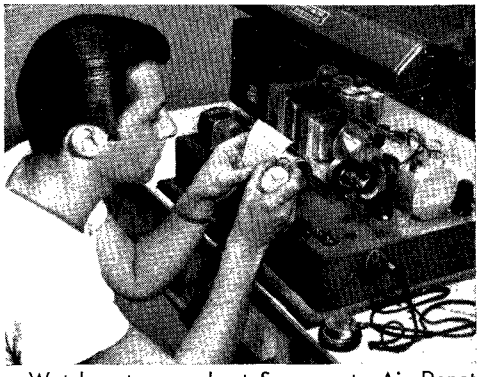
Watchmasters Keep Air Forces On Time

IT IS OBVIOUS that the split-second timing of Air Force operations makes it necessary for the watches used by aircrew members to tell the exact truth. It is also obvious that the village jeweler's time-honored method of regulating his customers' watches by checking them with a master clock, sometimes for weeks, is out in the kind of fast-moving warfare that is being fought today.

The Army Air Forces' answer to this is the "watchmaster" — an instrument that makes it possible to regulate a watch to 100 percent accuracy in less than a minute. No master clocks play a part in the method. The exact speed of the timepiece being tested is figured mathematically by a sound-excited printer on a graph moving at constant speed.

A straight, smooth line on the revolving graph means the watch comes up to Air Force standards. A rising line means the watch is fast, a falling one that it is slow.

To assist the repairman locate the trouble in an imperfect watch, the watchmaster is equipped with an earphone. This is to the repairman what a stethoscope is to a physician. With the graph it diagnoses the ills of a timepiece all the way from a simple cleaning job to a cracked jewel or defective mainspring. Guesswork is completely eliminated.



Watchmaster graph at Sacramento Air Depot reveals a slow watch with mathematical skill.

The watchmaster is especially valuable to navigators over the Pacific where there are no radio beams to follow, and where it is necessary to know the exact time to make readings from the sun and moon.

Portable Hangar

for Task Force use

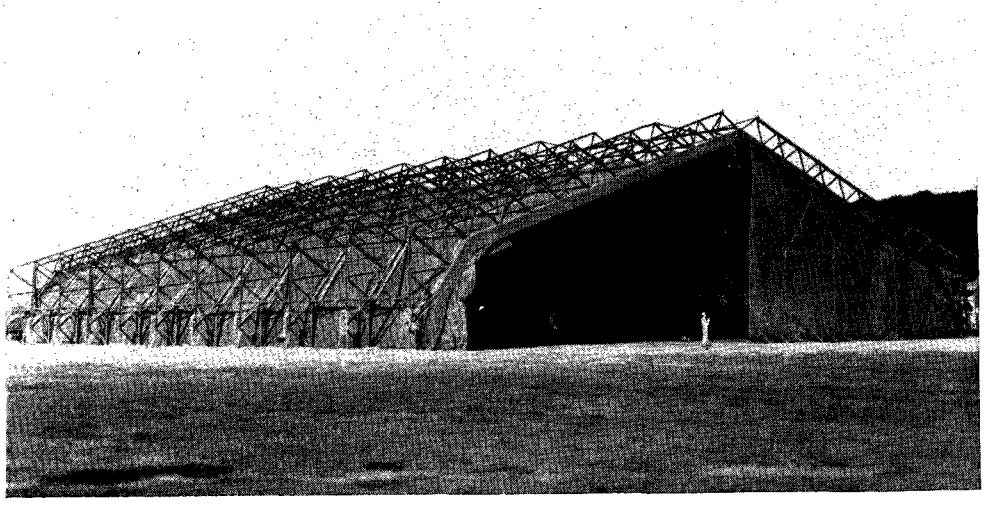
A NEW PORTABLE HANGAR, developed by the Engineer Section of the Directorate of Base Services, has gone into production. The new hangar is designed for use in all theaters of operations for the repair and storage of airplanes, supplies and equipment, or to house and hospitalize troops in the event of an emergency.

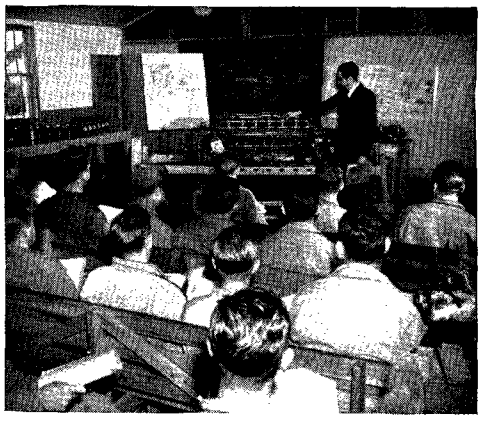
The frame of the hangar is of cold formed steel and the coverings and end doors are of a specially treated dark canvas, opaque to light of low intensity, waterproof and flame resistant. In cold climates local wood sheathing can be substituted for or added to the canvas covering, thus obtaining additional insulating qualities. The size of the hangar can be adjusted to fit almost any need by simply adding or subtracting bays.

The normal-sized portable hangar weighs about 52 tons, is 35 feet high. The canvas covering and steel frame can readily be broken down into small bundles for ease in shipment. Experience in erecting the hangar indicates that unskilled troops can put it up within three or four days, and that it can be dismantled in much less time.

A portable, oil-fired, circulating air heating unit has been specially developed for heating the hangar.

Below is the Air Forces' new portable hangar.





Rolls Royce by Packard

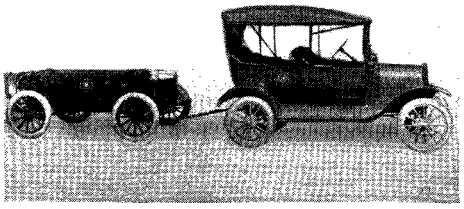
STUDENT mechanics at Selfridge Field, Michigan, are learning about the Packard-built Rolls-Royce 12-cylinder V-type engine direct from the people who make it. This has been made possible by the Field Service and Service Instruction Department of the Packard Motor Company, which has donated the services of three instructors and much valuable equipment to the job of teaching Selfridge soldiers how to maintain the American version of this famous British engine.

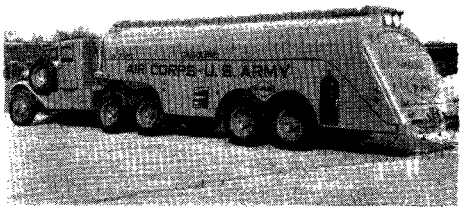
The course given by the instructors is one of many arranged by Colonel William T. Colman, Commanding Officer of Selfridge Field, for the Air Service Command is to train ground troops to operate under field conditions—without the conveniences of permanently established bases. A typical class scene is shown above.

As a result of Colonel Colman's arrangement, there is little Selfridge mechs do not know about the Rolls-Royce—the power plant of the P-40F and a number of other Allied planes.

Among other things the mechanics have learned that the Rolls-Royce engine is not something new—it was designed about thirty years ago in England, and is even now *basically* the same as it was before World War I. Naturally, because of the demands for more power and high altitude performance, improvements have been incorporated. For one thing it has been necessary to add a reduction gear and supercharger of the two-speed type—low is 8.15 to one for altitudes below 13,000 feet and high is 9.49 to one for altitudes above 13,000 feet.

—*Capt. Richard M. Ramey*





Progress: Airplane design is not all that has advanced in the Air Forces since World War I. There has also been progress in other, supporting fields.

Typical of this progress is the steady advancement in the design and capacity of aviation gasoline trucks, vividly illustrated by these pictures. At left is shown a 100-gallon trailer, used to refuel the Handley-Pages and Sopwith Camels of World War I. Ready to pull this tank to the flight line is one of the then "latest" types of mechanized ground equipment—a Model "T" Ford.

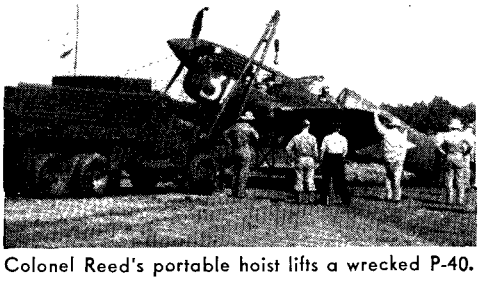
As the airplanes got bigger and better, so did the gasoline trucks. The center picture shows a 600-gallon truck of 1928 vintage bringing gas and oil to a Keystone bomber. At right is a modern 4,000-gallon gasoline truck and trailer, used to refuel the largest of Army Air Forces planes. It can "gas up" a Flying Fortress quicker than the 100-gallon tank shown at left could fill the baby gasoline container of a Sopwith Camel.

New Truck Hoist

A PORTABLE HOIST that can easily handle an 8,000-pound plane has been developed by Lieut. Col. James H. Reed, Jr., Commanding Officer of the Sub-Depot, Morris Field, North Carolina.

The hoist is designed for use on winch-equipped, two-and-a-half-ton government trucks. It is made largely from two iron pipes three and a half inches in diameter, and wire cable. The cable is used to anchor the hoist to the truck.

When in use the hoist rests on the truck's front bumper, with detachable supports used to prop it up. The wire cable is extended from the top of the hoist entirely around the body of the truck, and fastened in the rear with clamps. When not in use the hoist is supported from the side of the truck by means of brackets. When needed it can be slipped off these brackets and on the bumper in less than five minutes.



Colonel Reed's portable hoist lifts a wrecked P-40.

The total cost of the unit is under $200. In most cases it will do the work of a much more expensive wrecker truck, even though it is much easier to handle and much cheaper to operate. It can be used for a number of different purposes, including lifting wrecked planes to place them on trailers, for changing engines, and for actually moving wrecked planes from runways and fields. In this case wheels must be used under the front bumper in place of stationary supports.

The Sub-Depot at Morris Field will furnish prints and drawings of the device to any squadron or Air Forces unit requesting them.

Van Slyke Technique—Here's what some of the soldiers behind the battlefronts are doing. The scene above is the high-altitude pressure chamber at Wright Field, and the hand on the face of the altimeter in the center of the picture shows that the men are in the low-pressure atmosphere of 40,000 feet. In the foreground Major David B. Dill, high altitude scientist, has just taken a sample of blood from the arm of Staff Sergeant Thomas Green, while Staff Sergeant George E. Hohenshilt swabs the puncture. The sample will be tested by the Van Slyke technique to show the effect of extremely high altitudes on human blood. Experiments like this help airmen to penetrate to higher and higher altitudes with safety.

Jack and Dolly

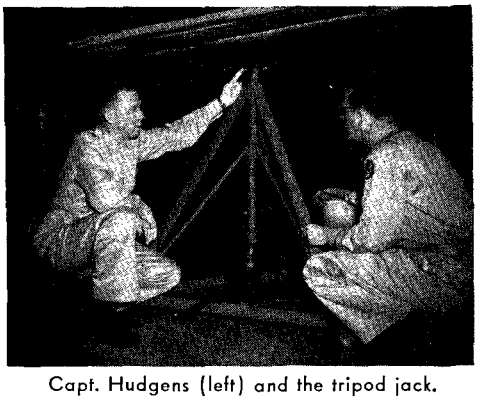
THE INGENUITY of Captain J. N. Hudgens, Sub-Depot Engineering Officer at Drew Field, Fla., has greatly increased airplane maintenance efficiency at that station through the invention of inexpensive time- and labor-saving devices.

Two popular inventions of Captain Hudgens are a man-powered tripod jack that saves wear and tear on the expensive hydraulic jacks used in airplane repair, and a four-tier movable repair tray, known as a "Tray Dolly."

Captain Hudgens' jack was made from angle iron and heavy gauge pipe. It stands on a three-foot triangular base, is 52 inches high, and has an adjustable horizontal pipe attachment approximately an inch and a half in diameter. There is also a metal pin that is used to hold the jack at desired heights. After the parts of this jack are cut to the proper lengths they can be welded together in little more than an hour.

Although it took him only a few days to invent it, Captain Hudgens believes his jack will last a lifetime if it is not overloaded. So successful has it been that, since the first one was constructed many more have been made and put in use by the Drew Field machine shop.

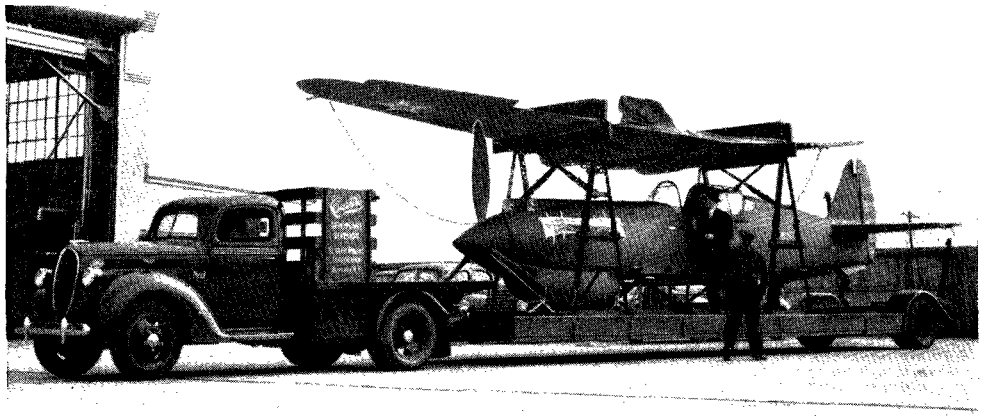
The Tray Dolly is made from scrap lumber. It is used as a place to shelve airplane parts during repair, thus keeping them off the floor where they may become misplaced,



Capt. Hudgens (left) and the tripod jack.

dirty or bent. Tray Dollies can be marked with chalk numbers so mechanics know to which plane they belong. Castor wheels permit them to be moved easily to any part of the hangar when they are needed.

The tray dolly protects plane parts.



This is how P-40s get around before they have wings to spread. The scene is an Air Forces materiel receiving center, where the plane has been brought for final assembly and delivery to the Army. The trailer was specially built by Curtiss-Wright for this journey from its factory to the Air Forces "induction" station. After final assembly here, the plane is ready to be flown to the squadron to which it has been assigned.

Captain Parker demonstrates his salvage machine.

Can Salvage Machine

SALVAGING tin cans may seem like a very minor part of winning a war, but at a place like Cochran Field, Macon, Ga., it can get to be quite a problem. Cochran has been using up tin cans at the rate of 50,000 a year- enough to make salvaging really worth while, but also very difficult.

In fact, up until a few weeks ago it was taking four men two and one-half hours a day to cut up and crush used cans in a manner suitable for salvage. What's more, they were using up $25 can-openers at the rate of three per month.

This was the kind of situation that to Captain Sheldon C. Parker (above), mess officer at Cochran, constituted a challenge, and he did something about it. The result is a new machine that cost only $12 to construct, and which has cut the time spent in salvaging cans at Cochran in half. It is made of molybdenum, one of the hardest of metals, and after more than three months, has shown no appreciable sign of wear.

Captain Parker's machine is set upon a table of steel. A jagged tooth die is set into a plate which is fixed on the table, and another one is set in an upper plate that can be brought down by operating a hand lever.

The dies of Captain Parker's salvage machine have been made in three sizes, making it possible for the machine to cut up 95 percent of all cans issued by the Army quartermaster. The dies are easily interchangeable; pins hold them in place, and no tools are needed to insert or remove them.

For Better Maintenance

THE aircraft maintenance record of Lemoore Sub-Depot, Lemoore, California, has been greatly increased during recent months by means of an awards system developed by Lieut. Col. F. H. Barber, Commanding Officer.

The system is simple; it consists of awarding a plaque each month to the squadron turning in the most efficient maintenance record. The record is computed as follows:

Each month the average number of planes in commission in each squadron daily is divided by the average number of planes assigned to each squadron daily. This gives the percentage of planes that were in commission in each squadron during the month for which the award is to be made. When a plane is laid up through no fault of the squadron maintenance men (such as from a shortage of spare parts) it is counted as being "in commission" as far as the award is concerned. Colonel Barber's "awards chart" looks something like this:

School* Squadron	Av. No. Planes on Hand Daily	Av. No. Planes in Service Daily	Percentage of Planes in Service
First	32.74	32.37	98.59
Second	32.88	32.53	98.94
Third	30.11	29.53	98.07
Fourth	32.84	32.03	97.53
Fifth	32.84	32.57	99.18
Sixth	24.69	24.27	93.30

* Squadron numbers are fictitious.

In this competition, the Fifth School Squadron would be adjudged the winner.

PICTURE CREDITS

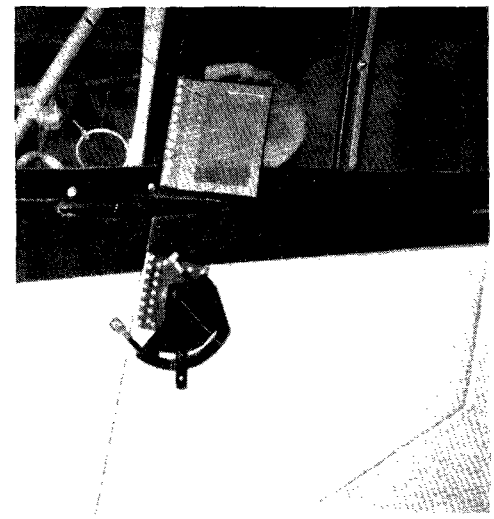
12-13: Sovfoto; British Ministry of Information; British Combine; Rudy Arnold. 14: British Ministry of Information. 25: Lockheed Aircraft Co. 26: Rudy Arnold. 27: Associated Press. 29: Boeing Aircraft Co. 34: Rudy Arnold. All other photos secured through Official Army Air Forces sources.

Inexpensive Bombing For Civil Air Patrol

MANY small Civil Air Patrol planes covering long reaches of the American coastline are equipped with inexpensive but effective bomb racks and bombsights invented by Major Lester G. Orcutt while he was stationed at Morrison Field, Florida.

The bomb rack was designed, built and installed on a Stinson 105 in 48 hours, at the request of Army Air Force Headquarters. It was built to carry 100-pound demolition bombs so CAP planes could blast subs they spotted on their daily patrols.

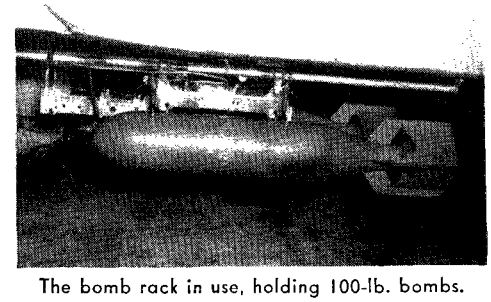
Pilots who flew the planes soon wanted a bombsight so they could aim their bombs. Two days later Major Orcutt had turned one



Major Orcutt's bombsight, in position.

out. The materials only cost 20 cents, but it was effective up to 3,000 feet. So successful was the bombsight and racks that they have since been produced en masse for light patrol planes in all parts of the country. For certain special purposes it has even been used on occasion in regular military planes.

Major Orcutt's bomb rack is a metal frame attached to the right lower longeron. The release lever is placed on the floor of the



The bomb rack in use, holding 100-lb. bombs.

cockpit right in front of the co-pilot's seat. Since the first design, the rack has been improved so that it can carry two demolition and two smoke bombs.

The bombsight is made of metal and consists chiefly of two adjustable sight rings. It is attached on the outside of the cockpit door of the small planes for which it was designed. The positions of both the sight and the racks are shown in the accompanying photographs.

(Continued from Page 3) 293 enemy planes, probably destroyed another 150 and have damaged 192. That is a record unequalled by bombers of any other nation. However, we must not rest on our laurels and think smugly that all is well, for we know it will not be long before the Germans come out with an answer to our Flying Fortresses, and we must be ready for it.

For a long time, we had our P-38s in England and tried vainly to get them into a fight to determine just how good they were. The Germans would not close in and fight. Recently, however, the Germans have fought us in the area over Tunis. To date the P-38s have held their own, even though they have had a very difficult task. They have covered and protected the ground troops, and at the same time met the German ME109 and FW190 fighters. The number shot down has been about even, so we are satisfied.

From Air Marshal A. T. Harris, RAF, to Lieutenant General H. H. Arnold, AAF:

By the first anniversary of Pearl Harbour the Japs are already paying dearly in the Solomons and New Guinea for their infamous assault. The Italians who begged a share in the destruction of London (with pitiful results) cannot take even our minor air offensive and are evacuating their cities in panic. It now remains for Germany to feel the weight of combined allied bomber attacks. The Reich will have plenty of new scars to show by December 7th, 1943. Greetings and good luck to the U.S.A.A.F. from Bomber Command.

If we can always shoot down plane for plane with the Germans, it will not be long before we have definite air control, for we cannot only produce more planes than they can but we can also turn out more and better combat crews.

I TELL you now that both the German and the Japanese Air Forces are on the down grade. They have passed their peak. We are just approaching our peak in airplane production and combat crew training. Our plane production alone is more than that of the Germans and Japanese combined. We have in addition the production of the British and the Russians. So despite the long pipe lines which we must keep filled, our enemies are playing a losing game in the air. They are reluctant to meet us in an all-out combat and yet if they do so meet us, it marks the end of their control of the air, even over their own countries.

Now just another thought about this air-warfare. Few if any of us have had time to figure out just what effect our Army Air Force planes have had upon enemy warships and freighters and troopships. This is what we have done:

Sunk	51
Believed sunk	21
Hit and damaged	159

Those ships were all types from battleships to destroyers, tankers, cargo ships and troop carriers. They were moving and standing still. Some were in harbors, others in narrow channels and still others out in the high seas hundreds of miles from shore, but regardless of where they were our bombers have been able to hit them and sink a large percentage of them.

On land we have dropped millions of pounds of explosives. The results have been devastating. When General Montgomery's troops reached Benghazi they found the harbor and city a mass of ruins and debris. The port was burned out, the docks were destroyed and there were quite a number of ships sunk in the harbor. We dropped about a million and a half pounds of bombs on that place.

Today we have our bombers working in eight combat zones. Each day that passes sees our numbers increase and our striking power building up. Within a few months the Germans, the Italians will be feeling the impact of these hundreds of planes dropping their bombs, not on one or two nights a week but every day and night in the week.

WHEN that time comes we will hit their submarines while being constructed, on their ways, at their bases and out in the wide oceans. We will hit their transportation facilities, their industries, their munitions plants, their airplane and tank factories. Hundreds of thousands of their people will have to move to other localities. They will realize what a true war of today means. Such is the fate that will come to both Germany and to Japan.

That is the kind of missions that you men here today have ahead of you. You must be ready to take your place in the gigantic Air Force Team slowly growing, relentlessly preparing for this tremendous task. It is going to be a tough hard task—not an easy one—but we can and will do it.

Now I'll give you a story to illustrate the kind of *fighting spirit* that you must have.

This combat story is revealed for the first time. Recently, in the Southwest Pacific, A-20 light bombers and B-26 medium bombers attacked Japanese anti-aircraft positions at Soputa. Our planes roared in at an altitude of 75 feet, barely skimming the tree tops. The Jap anti-aircraft guns were hidden in among those trees but that didn't stop our pilots from dropping their parachute bombs with deadly effect. Parachute bombs are terrifying things. They take more time to hit the ground, but all of the fragments are thrown into the air when they burst—few are buried in the ground. Our planes, flying only 75 feet up, were able to drop these bombs with pinpoint accuracy—and get away in good time before they exploded. I am proud to announce that we were the first air force to develop and use this deadly war weapon.

In this raid on Soputa, Jap anti-aircraft guns were destroyed. Ammunition dumps were exploded. In this thrilling action an anti-aircraft shell exploded near one of our A-20s. The burst blew the plane's tail up in the air, and damaged the controls. The pilot, Captain Edward L. Larner, 25, of San Francisco, could not get the plane back on even keel. His plane rammed through the tree tops for over a hundred feet. It collected foliage and brush until the plane looked more like a Christmas tree than an A-20. The nose of the plane and the leading edges of the wings were smashed in, but Captain Larner kept his head and finally pulled up out of the trees. Although there were countless holes in the wings, with broken branches protruding—he kept on flying it—but with difficulty. When the Flight Commander returned *for another run* to machine-gun the Japs, Captain Larner apologized to the Flight C. O. for withdrawing from the formation because, as he said, his *"plane was hard to fly!"* But he flew that plane back to its own airport and landed it safely. That pilot never heard the word quit. With Captain Larner was Sergeant Otha M. Pierce, 32-year-old aerial gunner from Duncan, Oklahoma.

From the Commanding General, Army Air Forces, to Air Marshal A. T. Harris, RAF:

The celebration of this first anniversary of Pearl Harbor is a solemn moment in our lives. The memory that one year ago from this day our belief in the honorable intentions of a portion of the human race was irreparably shattered will constitute a guide for our actions in the future.

The encouraging results already attained from the close alliance between the R.A.F. and our Air Forces will continue to bear bigger and better fruit.

We return to you our kindest greetings and hope that the good fortune attendant on the British courage and skill goes forward with us to the end of time.

Few people today realize what a substantial contribution toward the winning of the war our bombers are making — be they B-17s, B-24s, B-25s, B-26s or light bombers, such as the Douglas A-20.

I would particularly like to speak of our heavy bombers — the B-17 Flying Fortress and the B-24 Liberator. They are our basic *offensive* weapons. The Flying Fortresses and B-24 Liberators are bombing submarine bases, airplane factories, hydro-electric plants, ammunition dumps, food stores, rail centers, naval installations and ships in all corners of the world.

The heavy bomber is blasting the enemy at high altitudes, middle-altitudes, or just

above the house-tops. It is withstanding blistering anti-aircraft fire.

Many different kinds of missions are required of bombers to deal with different kinds of objectives. The retreat of General Rommel's Afrika Korps illustrates this wide *variety* of offensive air action. In the first place, the British were able, with the help of the United States Army Air Forces, to attain and maintain air superiority over Libya and Egypt.

No campaign in this war has been won by a task force not having air superiority.

DURING the past twelve months our research engineering program has been vastly accelerated. I cannot reveal the *most* gratifying developments. However:

(1) Our .50 caliber machine guns have proved themselves to be terrific weapons of aerial destruction. They are one of the outstanding successes of the war, in which Americans can take just pride.

But listen to this: Our highly destructive .50 caliber machine guns will seem like peashooters, compared with the fire-power that we are putting into our newest, big ships.

(2) We have steadily improved our standard models of fighters and bombers.

(3) Some time ago I said that the B-17 and the B-24 were perhaps the last of the "small" bombers. We have new fighters and bombers on the way with tremendously increased speed, fire-power, bomb loads, range, and maneuverability.

Not long ago the Tokyo radio announced that the Japanese public could expect to be raided again before the war was over by American bombers.

For once, I will say to Tokyo, you are right! Yes, we are coming and we hope to make it soon. And when we do come, it will be in large numbers — and we won't stop with one visit. We will return again and again.

(4) Our glider program is proceeding on schedule.

(5) Our newest transports will carry more freight and more men.

(6) Our newest motors, both air-cooled and liquid-cooled, have been vastly stepped up in horsepower.

(7) Photographic reconnaissance on our combat fronts is increasing in effectiveness due to new developments in cameras, and photographic technique. Our pursuit planes can take good pictures at 300 miles an hour, from 30,000 feet, accurately enough to show up individual railroad ties.

The past year has given us what some people call "sound morale". I am not especially fond of the word morale, but if morale is the only word that tells the story, then sound morale is what we've got, and got it in abundance. ☆

COMPRESSIBILITY

(Continued from Page 26)

we start creating compression waves which, like the bow wave on the freighter, require considerable additional energy simply because we affect the air for a greater distance roundabout.

When we start creating these shock waves they eat up energy at a tremendous rate, with the result that more power and more push simply make bigger waves but do not necessarily permit us to move any faster. It might be compared to the soap box politician who workers harder and talks louder but just can't say any more. It isn't the noise and fuss that counts. Actually, an airplane can create enough "fuss" so that it can never be dragged appreciably beyond a certain speed without using an impractically great power.

Airplanes since their inception have been built to take advantage of the characteristics of air when displaced gently, or, from the wind tunnel point of view, when the air flows smoothly over the surface. In the early days there was some thought that a rough surface on the wing gave more "bite" and consequently more lift. We now know, of course, that we get better results with smooth surfaces simply because we *reduce* the disturbance.

To visualize airflow around an airplane or a bullet it seems easier to think of the object standing still and the air flowing around it. As far as a little molecule of air is concerned, it gets the same reaction but it may be difficult at first to visualize the similarity between flow past an object and an object's motion through the air.

Actually, when an airplane wing comes along, the little molecule of air has to jump out of the way, speed up over the top, and come back down in behind the wing. The passage of the wing has, in effect, created a region of lower pressure and the air has to flow in to fill it up.

Again we get back to the old toothbrush. If the little molecule of air has been displaced too far it just can't get in fast enough to stick to the surface, with the result that the molecule gives up and leaves a disturbed region of relatively rarified and turbulent air on the surface of the after portion of the wing as it goes by. We get either a stall or a compressibility burble or a combination of the two, depending on the speed.

It may be confusing to think that an airplane may react the same way in going too fast as it does in going too slow. A stall is simply trying to get too much lift. We increase lift by the amount of displacement of the air and by trying to increase the downward push. At any given speed the little particle of air has to move faster in order to pick up this downward velocity and its ability to accelerate is limited. When it can no longer make the grade we get the condition known as stall, i. e. a breakdown in smooth flow.

At very high speed the little particle of air may not have to move so far, but it has to move faster, with the result that it again has to accelerate rapidly and its ability is again limited. These two factors are always tied together; consequently, any consideration of compressibility is a function not only of speed but also a factor of lift or displacement. This means that critical speeds for wave formation will not always be the same but will depend upon shape and altitude.

There has been a lot of nonsense observed and talked about the fact that the so-called critical speed, namely the speed of sound, will always be a positive physical barrier to the further development of aircraft speeds. One may find any number of theories to prove conclusively that airplanes cannot fly if built beyond a certain size or weight. Yet, flyable airplanes have been built twenty, fifty and one hundred times the weight of these so-called limits, depending upon which limit you choose. We could probably find that each 100 mile per hour milestone had some defender who claimed that it was impossible to go beyond.

By the same token, critical speed is probably more nearly like a wall or obstacle which has to be hurdled but may not necessarily be a hard and fast limit.

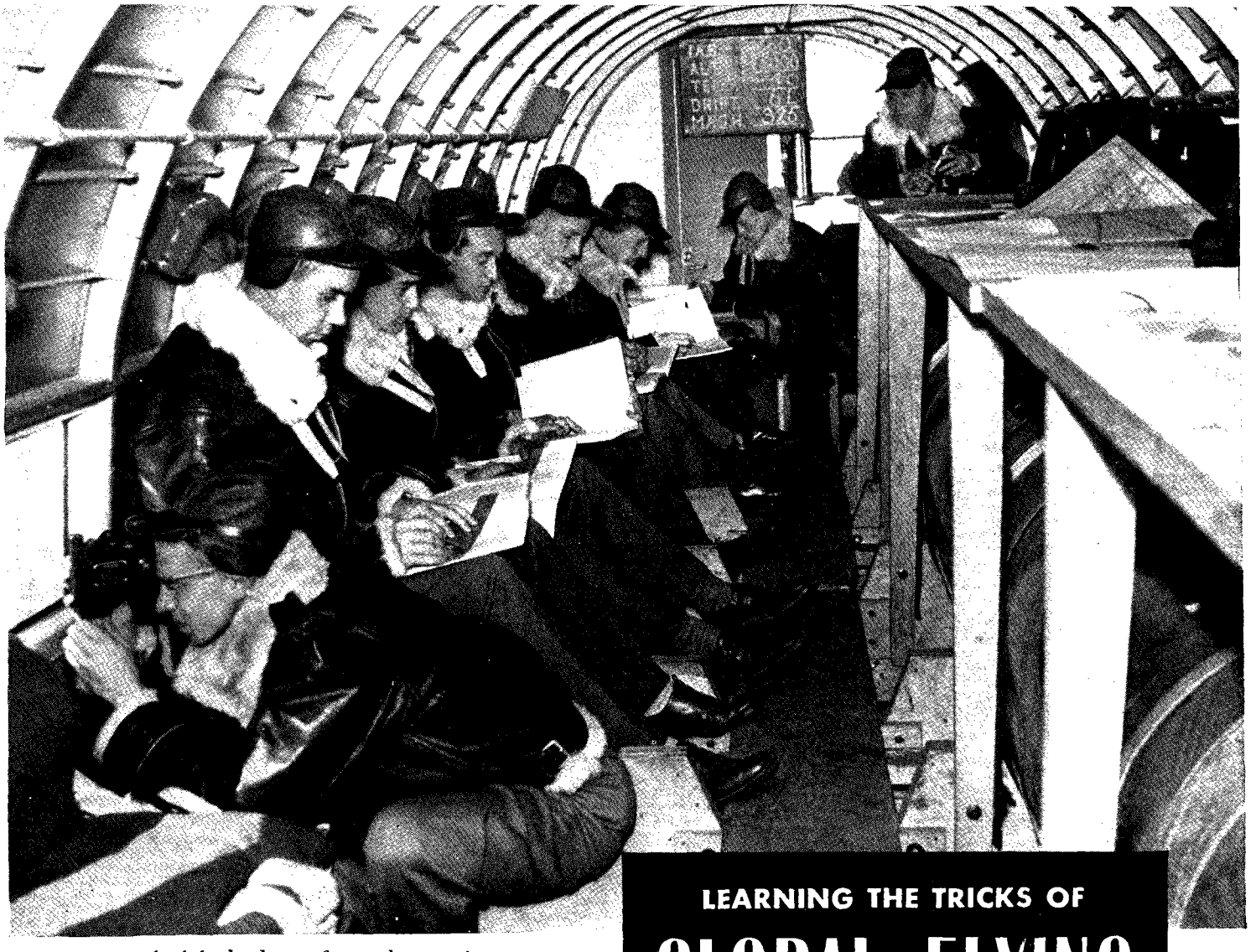
The crack of a bullet as it passes overhead is evidence that it is possible to build objects which can hurtle through the air at "supersonic speeds." One has only to visualize a bullet big enough to house a man to realize that it is conceivable that travel may be accomplished at such speeds. The problems of starting and stopping, and of control, are at the moment relatively unknown, but exploration of the unknown has always been a challenge.

WHO wants to ride a bullet? Literally hundreds of pilots have ridden successfully in projectiles which travel at speed definitely above the speeds of slow bullets and only slightly less than some higher speed projectiles. For instance, a 600 mile per hour dive, which is well within reason, involves a speed of very nearly a thousand feet per second through the air. At high altitudes this speed is definitely above the speed of sound.

It is hard to visualize what it would feel like to ride in a bullet, but at the speeds now reached a number of effects due to compressibility have already been observed. Another article will attempt to describe some of these effects by calling on imagination to describe some of the possibilities which might be encountered when riding a bullet.

We know what the shape of a bullet should be. It usually has a sharp point and the tail is usually blunt. The curvature of the shape and the sharpness of the nose are apparently critical. Perhaps airplane designers will have to study ballistics and trajectories to design airplanes in the future. Perhaps our blunt-nosed, sharp-tailed airplanes should simply swap ends when they cross the threshold of the speed of sound.

Bullets, boats and propellers have been making waves for years; to this knowledge we have added some waves peculiar to airplanes. In a succeeding article some of the design considerations influenced by compressibility will be presented. ☆



Aerial schoolroom for student navigators

LEARNING THE TRICKS OF

GLOBAL FLYING

By Herbert H. Ringold

You have to know all the trade secrets when you transport the big planes from here to hell-and-gone and back again

THE plains of Northern Missouri are pancake flat, lack a sizeable body of water and have neither tropic heat nor Arctic cold. But for practical training purposes the 600-mile radius around Rosecrans Field at St. Joseph might be a jungle, desert and ocean all in one.

Rosecrans deals in the trade secrets of global flying. There at the Air Transport Command's Operational Training Unit trainees are taught the ins and outs and ups and downs of flying our biggest ships all over the face of the earth.

In global flying you've got to know all the tricks. You've got to know the right way to come down in an emergency on water, beach, desert and jungle; how best to maneuver a heavily loaded, unarmed plane while under attack from enemy fighters; the precautions to take against sabotage; how to load for maximum range with minimum fuel.

For emergency landings in jungle country, as an example, they recommend coming in with gear up, making full use of flaps to land at minimum speed. They suggest landing nose high into the heaviest possible jungle growth to use it for a cushion.

Over water, you are instructed to land gear up, without flaps, to prevent a diving motion, since the flaps are located below the center of gravity. A B-17 will sink in about 30 seconds so you have to know how to get out in a hurry and inflate your life raft.

For beach landings, you come in gear down and flaps down, exactly as if making a runway landing.

On the desert, come down on your belly; your plane can be jacked up and flown out again. This was proved in Africa when a flight of P-40s, being convoyed by a B-24, got lost in a sandstorm. Twelve planes were in the flight and they all came in gear up. Of the twelve, ten were flown out immediately; the other two were flown out after their props had been straightened. And there wasn't an injury to the entire flight personnel.

That's the kind of instruction the boys at Rosecrans are getting under the direction of Lieutenant Colonel Curtis A. Keen, Commanding Officer; Captain Norman K. Warner, Director of Training; a staff of old commercial air line and Army pilots with thousands of hours of commercial air line and transoceanic flying; navigation and radio officers to whom the stars and waves of Africa, India and Australia are as familiar as their home heavens, and technical research pilots whose practical proof on long range flying procedure adds factors of safety and miles per gallon to the performance of the aircraft these crews are to deliver to the battle fronts of the United Nations.

A flight engineer arrives from Nashville, Tennessee. A radio *(Continued on next page)*

LEARNING THE TRICKS OF GLOBAL FLYING

(Continued from Page 37)

operator has just finished training at nearby Scott Field, Illinois. A navigator comes up from the school at Coral Gables, Florida. A co-pilot recently from four-engine training at Turner Field, Georgia, may be paired with a pilot recently commissioned from commercial air lines (many pilots at Rosecrans are) who may have previously been an operator of a civilian flying school, an old barnstormer or a forced fire patrol pilot. All are reserve officers who maintained their flying efficiency in civilian service, bringing to this emergency plenty of hours in commercial flying plus Army background from original training and reserve officer status.

THESE five men live, learn and fly together in the same ship they will eventually take out to some foreign base. Right off, they are formed into a five-man flight crew, and are drilled in teamwork. If one man can't get along with the rest, he's moved to another crew.

A series of examinations and flight checks are first on the training list to determine what the men already know. Then comes individual instruction.

The flight engineer, for example, is taught the peculiarities of his particular job in long range flying. He learns the specific measures to be taken against sabotage. Check tires for cutting. Watch out for crossed wires and foreign material in the battery cells. Guard against abrasives in the generators. Be sure of the wiring around the fuses. See that there has been no tampering with the solenoids. Make a general check for damage to the electric wiring. Pay careful attention to the fuel system; the introduction of water, chemicals, or any foreign matter will cause a sudden stoppage, and a handful of sugar will mess up the works. The lubricating system must be gone over with a mother's patient care. Straw or rags in the intake scoops may cause a malfunctioning of the carburetor. The transfer system has to be inspected for leaks. From top to bottom, inside and out, the flight engineer learns what he might run up against in foreign territory.

THE radio operator is taught secret codes and ciphers for overseas operation. He practices code until his speed is improved to a point of perfection. He gets so he can recognize a Messerschmitt and a Zero in his dreams. He gets additional training in servicing his radio equipment while in the air, and learns about the different types of radio equipment he may have occasion to use.

The navigator discovers that he is the most important man in the plane while it is making a water crossing. To give him specific training, "The Little Red Schoolhouse of the Air" has been utilized. This is the name given a C-53 which has been rigged up to hold seven or eight student navigators, a radio operator, and an instructor. When the plane starts off on a cross country flight, the navigators go to work exactly as if they were crossing the ocean. They don't get to look at any landmarks, since most of the flights are made at night and they have to bring the ship in on celestial navigation. It is a simulated trans-Atlantic flight and the boys are made to realize that 700 miles out of Natal they won't find a conveniently located church spire to show them the way home.

Following individual instruction, a five man crew is brought together for coordinated training. From now on, this is the same crew that will fly together to any point on the compass. They are taught the approved methods of avoiding ack-ack fire; what to do in case the station they are approaching fails to recognize them; the principle of using corridors for approach; and the necessity for use of proper recognition signals to avoid causing false air raid alarms.

Specific instructions are given concerning proper loading and balance. This is particularly vital to insure the maximum range with the fuel available and to guarantee stability in flight. Information on power control is given to insure maximum range under any conditions at any altitude, including the possibility of one engine failing.

Emergency methods of fuel transfer in actual flight are also taught. One crew on a trans-Atlantic mission found that their fuel tank was losing gas rapidly. Everything indicated that the tank had been punctured by a machine gun bullet. But a fast and accurate check in flight proved that a transfer pump had been turned on accidentally; the fuel from the auxiliary was going in and overflowing. A quick switch and the faulty operating pump was put in proper working order.

A DAY celestial flight is made with no maps and an allowable error of only two miles from the set course. A night celestial flight is not less than 600 miles each way with complete dependence placed upon three star fixes and an allowable error of not more than two miles. A day D/R flight is taken without sun lines, maps, or radio facilities. The Link Trainer is used for Q.D.M. and loop approaches through corridors hemmed in by mountain and barrage balloons. An instrument check on range includes the fade 90-degree system with field approach, but requiring a pull out. Regular cross country flights are an essential part of the training. And this is all in addition to 31½ hours of academic instruction and 17 hours of military training, including Infantry and Physical Drill.

Rosecrans Field was activated early in July of last year. For months the men lived in tents and the Commanding Officer had his headquarters in a trailer. Permanent barracks have probably been built by now, but it won't make much difference. At Rosecrans you practically live in your plane, getting ready for the time when your ship will be your home on any one of the four continents. ☆

Old Sarge Finds Our Mechs Modernized

By

Corp. Larry H. Boeck

MASTER SERGEANT F. G. BULLOCH has been in the Air Forces for 22 years and he knows a sharp guy when he sees one.

Sergeant Bulloch, who is line chief of the 62nd base headquarters and air base squadron engineering department of Sheppard Field, Texas, is convinced that things have changed as far as being a mechanic is concerned.

"Time was," the Sarge explains, "when a mechanic was a jack-of-all trades. He fixed anything that needed fixing on a plane. Today, that's different. The fellows graduating from A. M. school learn to do everything, of course . . . but they also learn a lot more than mechs did when I was going to school and they have to be more alert and studious."

"The mechs today," he points out, "are specialists, which means they're hell on wheels for some special job like props, hydraulics, and the like. This is so because planes have changed a lot. Back 20 years ago, a crate was considered powerful when it had an eight volt electrical system. Most ships today have 32 volts."

"Another thing: the old ships had a horsepower of 150. Today, that's stepped up to a hefty 2,000 horsepower. Those vintage crates didn't have any 100 octane gas, or 92, for that matter. All of it was unleaded."

For the radiators, the Sarge remembers, the boys used plain, ol' alcohol. It looked a lot like the white gasoline now used in gasoline stoves. The resemblance was so great he remembers one mechanic who poured the gasoline into the radiator instead of the alcohol. The boys started to warm the ship up and the gasoline came out of the overflow pipe. Then a blaze started. All of which, says the Sarge, is a little tip to be alert.

To start the ship, the boys used the old hand prop system, since there was no starters, toggie switches or T. O. 02-1-29.

"The biggest change," Sarge Bulloch relates, "is in the way the mechs today work. They really are 'commandos in coveralls.' The boys have to be fighters as well as mechs, and the way they have kept battered crates aloft in the war zones is great testimony to their ingenuity, fighting heart and ability."

"Yes, sir—commandos in coveralls. A wrench or a tommy gun—all the same to the boys."—*Sheppard Field Texacts.*

Forced Landing

(Continued from Page 22)

Avoid snow drifts, broken ice fields and other rough going, unless it is absolutely necessary to cross them. Snow is not deep on ridges as the wind blows them clear. You *must* travel *slowly* and avoid exhaustion.

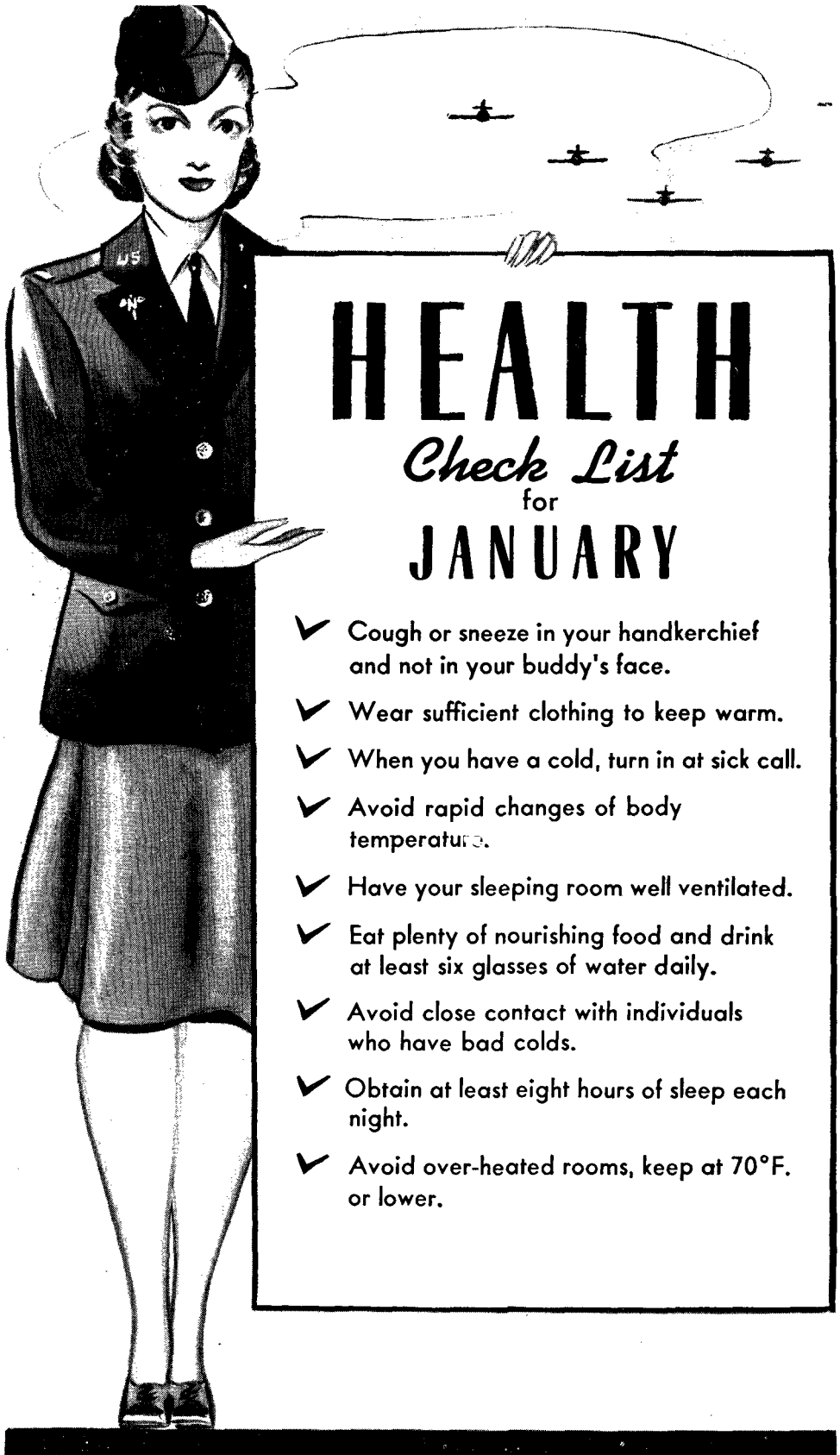
There is abundant water in the Arctic. The only bad result from eating snow is that it chills the mouth and throat and a great deal must be eaten to satisfy thirst. If river or lake ice is available, it can be chopped up and chewed or melted. At sea, last year's ice can be melted for drinking or cooking water. It can be recognized by its bluish appearance, as contrasted to grayish salt ice, and it produces a glare while salt ice is milky in appearance; also, last year's ice has rounded corners and cracks as a result of thaws and rains. During the summer, fresh water is found in the hollows on old ice.

When stopping for the night, get in a lee and make a tent out of your parachute, but be sure that wind-blown snow doesn't cover your camp during the night. A windbreak immediately adjacent to the tent is best. A boulder, cliff, a snow or ice-wall provides protection from the wind. A ten-foot square of silk or canvas makes an excellent tent; three corners are staked down pointing into the wind; the fourth corner is tied to a bush or tree. A small fire in the open end of the tent can be used for cooking and keeps the tent warm. Wood, coal, various mosses, and animal fats and oils may be used to make a fire. Iron pyrite is plentiful in many parts of Alaska and can be used as a flint and steel if matches are not available. The sparks must be caught on dry tinder; moss, grass and weeds can be made into tinder. A burning candle will produce enough heat to make a tent quite comfortable. If pine boughs are available lay them on the ground inside the tent so your clothes and sleeping bag do not get wet. Sleep with feet nearest the fire; they are the parts of the body that are chilled first.

If you have no equipment, you will not necessarily freeze to death. Eskimos have gone for many days in bad blizzards by sitting with their backs to the wind and their arms pulled up out of their sleeves and held close to the body. When the cold would awaken them from time to time, they would get up and move about to get warm again. However, if a person is exhausted when he sits down to sleep, he may not appreciate the warning symptoms of cold, and thus not get up when chilled.

Uninjured men forced down in the Alaskan wilderness, by proper use of their emergency equipment and rations, should be able to exist indefinitely.

Anyone assigned to Alaskan duty will do well to become familiar with Field Manual 31-15, Subject: Operations in Snow and Ice; Field Manual 1-240, Subject: Arctic Manual; Technical Order No. 01-1-67, Subject: Arctic Operation; and Alaskan Air Route Guide published by Air Intelligence. ☆



COMBAT REPORT

(Continued from Page 15)

Of course, every effort was made to lay the dust, but in most cases no black-top was available to cover the strips properly. Sometimes resort was made to the use of molasses —a trick learned in the Philippines, where the surplus of molasses would really hold the dust for a considerable length of time.

In New Guinea the problem was very much the same due to the hilly nature of the ground, except that if our planes ever got off the runway they frequently bogged down in the soft, swampy land. Operational needs often forced the use of these strips before dispersion areas could be built. The inability to effect dispersion immediately in many instances was the cause of the loss of planes from strafing by the enemy.

Most of the operations took place in the northeastern and northwestern parts of Australia. The climate and the type of operations were different from anything we had seen before. Our pilots and our combat and maintenance crews have experienced conditions they little dreamed existed. But, nevertheless, our men of the Air Forces have been masterful in their achievements.

On the northwest side, for example, we had one fighter group of P-40s that was especially successful. Ably led by Colonel Wurtsmith and skillfully managed by subordinate commanders, it established the remarkable record of 64 victories against 16 pilots lost from April 7 to the time of my departure from Australia on August 23. It is felt that credit should be given them for twice that number, as the Japs had to return home over 500 miles of open sea after this Group had jumped them. Many Jap planes were surely lost in the sea due to mechanical failures, such as holes in the oil coolers and leaky radiators, that forced them down some time after breaking off combat. Certainly others were lost through lack of sufficient fuel to return to their base.

FOR OPERATIONS off New Guinea, our bombers especially faced many difficult problems. They were usually based on the northeast side of the mainland of Australia. Often they had to fly 1,000 miles before reaching their point of departure for the raid.

If Rabaul was the target, they flew to an airport on New Guinea, refueled, and then headed for the target 550 miles away, first climbing over a 14,000-foot mountain range within the first sixty miles, which forced them many miles off the direct route. This meant a total of 3,200 miles an airplane had to cover to make one raid on Rabaul, approximately eighteen flying hours for the crew. Excessive use of engines, the wear and tear of combat and the effects of dust not only cut down the operational life of our planes but necessitated more frequent rest for the combat crews.

The weather there adds a great deal to the strain of combat. A constant equatorial front hangs in a northwesterly-southeasterly line from New Guinea to the Solomons. It shifts back and forth only about sixty miles during the various seasons. Its weather has a nasty habit of being clear and unlimited one moment, and a solid sheet of rain the next.

Many of the pilots, in order to make their way home with gas still in the tanks, have to force their way through weather of this kind. The buffeting they get takes a lot out of them and their airplanes. Many of their missions had to be abandoned because of this front, and I feel sure that some of the ones that failed to return did so because of extreme meteorological conditions.

THIS weather, combined with combat, gives the navigator as difficult a job as he has ever experienced. The utmost accuracy on his part is demanded in flying over sea and jungle- -and this despite the lack of landmarks, decent maps, navigational and radio aids, and the inability to use celestial navigation because of heavy cloud formation. The fact that he seldom fails is a commentary on the fine training he received at home.

The Fortress really hits hard. To support the Marine landing at Guadalcanal on August 7, Colonel Carmichael personally led his Group over Rabaul. Not only did his Group plaster the Japanese main airfield of Vunakanai, but it shot down forty percent of attacking Zeros in an aerial combat that lasted for an hour and a half.

The B-26 and the B-25 have had a similar record over Lae and Salamaua. In one raid that I recall, the B-26s, without fighter escort, shot down fifty percent of the Japanese who attacked them.

Flying conditions in the Southwest Pacific theater demand the best in equipment and we have the best. But it takes proper maintenance to keep it that way. Here the ground crews are doing a remarkable job. None of us could fly without them. In our April raid on the Philippines from Australian bases, I personally saw how vital they are to flying.

Too much credit for the success of that operation cannot be given to the combat crews who not only faced the dangers encountered throughout the trip to, from, and during the raids, but who helped in most of their own maintenance and rearming once we arrived at secret bases in the Philippines. Their brilliant success, however, depended on the work previously done by the Air Force ground troops in Australia. He who does not pay tribute to the boys who keep him flying isn't much of an airman.

But the good work of our ground crews is generally reflected throughout all of the service. Despite obstacles and incredible hardships, our men are cheerful and eager to get on with the job of winning the war.

They do recognize that they are up against a ruthless enemy—one of the toughest foes we have to face. If he is successful in combat, he has accomplished a divine mission for the Emperor. Should he die, he then goes to one of the great Japanese shrines, where he is rewarded for his efforts with hot Sake wine and geisha girls. We should do everything we can to help him get there. ☆

ROLL OF HONOR

(Continued from Page 17)

AIR MEDAL

LIEUTENANTS: Lawrence W. Hanson, Phillip C. Seveilla. **WARRANT OFFICER:** Herbert G. Spees. **PRIVATES:** John M. Bowsen, Thomas N. Collins, Milton Kalter, Robert W. Murray.

OAK LEAF CLUSTERS

MAJORS: Clarence McPherson*, Weldon H. Smith. **CAPTAINS:** Felix M. Hardison (three Oak Leaf Clusters to Silver Star), Guilford R. Montgomery, David C. Rawls, Elliott Vandevanter, Jr. **LIEUTENANTS:** Melvin McKenzie, Austin Stitt. **STAFF SERGEANT:** Raymond P. Legault.

* Posthumous

CITATION

THE SEVENTEENTH PURSUIT SQUADRON (provisional), United States Army Air Forces in the Far East.—As authorized by Executive Order 9075 (Sec. III, Bull. 11, W.D., 1942), a citation in the name of the President of the United States, as public evidence of deserved honor and distinction, is awarded to the following-named unit. The citation reads as follows:

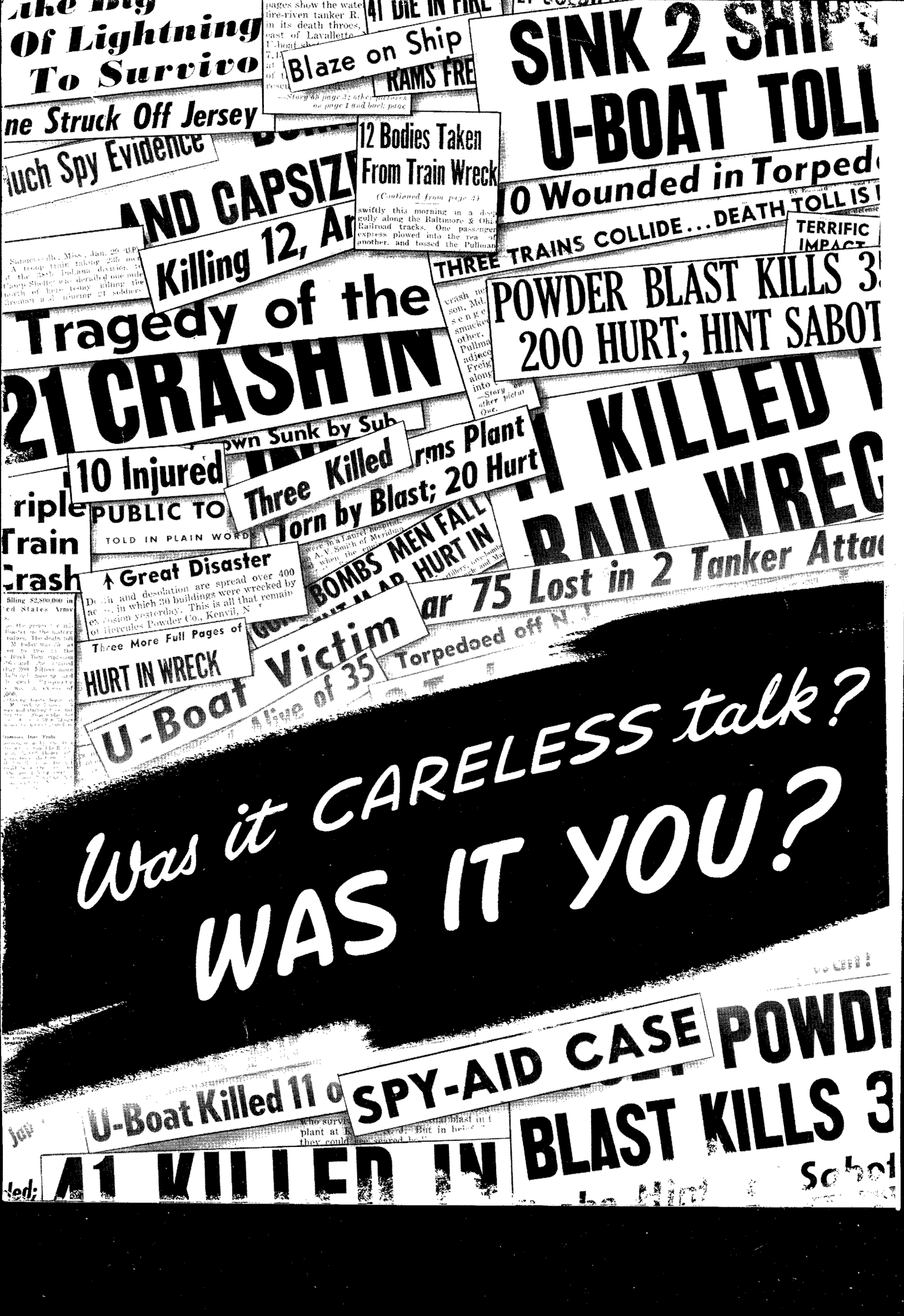
"The 17th Pursuit Squadron (provisional), United States Army Forces in the Far East is cited for outstanding performance of duty in action during the period January 14 to March 1, 1942. In the defense of Java and other South Pacific Islands and in the combined operations that checked the enemy and saved the Allied Fleet at Socrabaja, it repeatedly entered into combat against a numerically superior enemy while escorting A-24 dive bombers. In less than one month, under great difficulties, the 17th Pursuit Squadron shot down 38 enemy airplanes. Its pilots exhibited the greatest bravery and resourcefulness; its ground units, in the face of heavy enemy fire, performed all duties with utter disregard of personal safety. The superior courage and devotion to duty shown by this squadron will always be worthy of emulation."

ANSWERS

To Quiz on Page 10

1. (b) The tail assembly.
2. (d) A bubble octant is used by the celestial navigator to measure the angle of elevation of a celestial body.
3. (c) A British plane.
4. (c) 1903.
5. (c) The details of moving, quartering and provisioning of troops.
6. (b) Status does not belong. (Cirrus, Stratus, and Cumulus are three basic types of cloud forms.)
7. (b) Air speed.
8. (c) Aleutians.
9. (d) Phosgene is a lung irritant used for casualty effect in chemical attack. Has an odor like new mown hay or freshly cut corn.
10. (b) Mid-wing monoplane.
11. (c) 10 inches or less. (Tech. Order No. 03-5E-1.)
12. (c) Near West Point.
13. (a) True.
14. (b) False. (The Air Crew Members Aviation Badge is worn by other members of the crew.)
15. (b) False. A radial engine is an air cooled engine.
16. (b) False. BT stands for Basic Trainer.
17. (b) False. The senior should be on the right when walking and when riding.
18. Combat observers wings.
19. Russia.
20. German Messerschmitt 110. (This ship was captured by the British.)

If you NEED it ...
...can you USE it?


Was it CARELESS talk?
WAS IT YOU?

AIR FORCE

OFFICIAL SERVICE JOURNAL OF THE U. S. ARMY AIR FORCES

FEBRUARY 1943

AIR FORCE
OFFICIAL SERVICE JOURNAL OF THE U. S. ARMY AIR FORCES

February Brief

THE PRECISION with which paratroops were delivered at the right spot at the right time during the invasion of North Africa has been given wide praise. General Arnold recently cited that operation as "a credit to one of our newest Air Force organizations, the Troop Carrier Command, and to the parachute battalions," and added: "You will hear more and more of these organizations as we get deeper into this war."

In this month's AIR FORCE, Brigadier General Fred S. Borum, Commanding General of the 1st Troop Carrier Command, explains in an article on Page 8 how the Command functions and what is involved in aerial invasion. He also reports on troop carrier operations in the Texas air maneuvers last fall.

GALOSHES IN AFRICA? Sounds a little strange, but the "desert" war theater right now is featuring mud and cold, and winter clothing—even galoshes. You'll better understand why after reading the article on North African living and fighting conditions, based on the notes of an Air Force officer just returned from that area. It appears on Page 4.

YOU'RE FLYING entirely on instruments at 4,000 feet in a big C-53 transport with a crew of six aboard. Suddenly there is a violent crash as an oncoming commercial airliner hits you. Thirteen feet of your right wing is torn away, along with a portion of the aileron surface. Your ship goes into a steep spiral.

Get out of that one if you can! Captain L. H. Penn, Troop Carrier Command pilot, did. He pulled out of the spiral on instruments, established contact with a nearby airport, and came in for an emergency landing without further damage to his ship and without scratching himself or his crew.

Colonel Sam R. Harris, Director of Air Traffic and Safety, describes that bit of "beautiful flying" in an article on Page 6. He cites it as an example of "alert, clear-headed action and skill" in a discussion on the need for reducing pilot error as an accident cause in the Air Forces.

MAJOR CARROLL W. MCCOLPIN, 28-year-old fighter pilot, joined the Air Forces last September after 22 months of steady fighting over Europe, first with the R.A.F. and then with Eagle Squadrons. In fact, he is a former member of all three Eagle Squadrons, a distinction no one else enjoys, and commanded the Third Eagles for several months.

He is tied for top score in the Eagles with a total of eight enemy aircraft destroyed, one probably and an undetermined number damaged. In addition, he is credited with destroying two trains, two boats and three lorries.

Major McColpin, from March, 1941, through November, 1942, accumulated a total of 253 operational hours in 184 different sorties, which is a lot of combat time in fighter aircraft. While at Headquarters recently for intelligence interviews, Major McColpin was asked to do a first person account of his combat experiences, and he complied with the article which appears on Page 7 of this issue.

SEVERAL months ago, in the old Air Forces News Letter, predecessor to AIR FORCE, we published an organization chart of the Army Air Forces. It turned out to be one of the most popular features carried by the News Letter.

The Air Forces have undergone a number of changes since then, and, for the moment at least, the chart seems to have stabilized. (We cross our fingers with that one, having seen dozens of organization charts become obsolete at a moment's notice under pressure of the expanding Air Forces.) At any rate, we thought it time to present an up-to-date chart for AIR FORCE readers. It appears on the inside back cover of this issue, and is correct as of January 15.

Going a step further, we asked Colonel Byron E. Gates, Assistant Chief of the Air Staff, Management Control, the top man in such matters, to review the background of Army Air Forces' organization and discuss the present structure in some detail. The article by Colonel Gates appears on Page 13.

THE COMMANDING OFFICER of a bombardment unit in the Aleutians, following a B-26 mission over Jap-held Kiska Island, conducted a friendly contest, among crews which participated, for the best written narrative covering that action. The prize-winner was Technical Sergeant L. O. Gardner, a bombardier. We are happy to print his article on Page 17 for all Air Forces personnel to read, and we invite other combat units to follow suit with similar writing contests.

THE FRONT COVER picture this month shows armament men servicing the 50-caliber guns of a P-47 fighter.

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FORMERLY THE AIR FORCES NEWS LETTER

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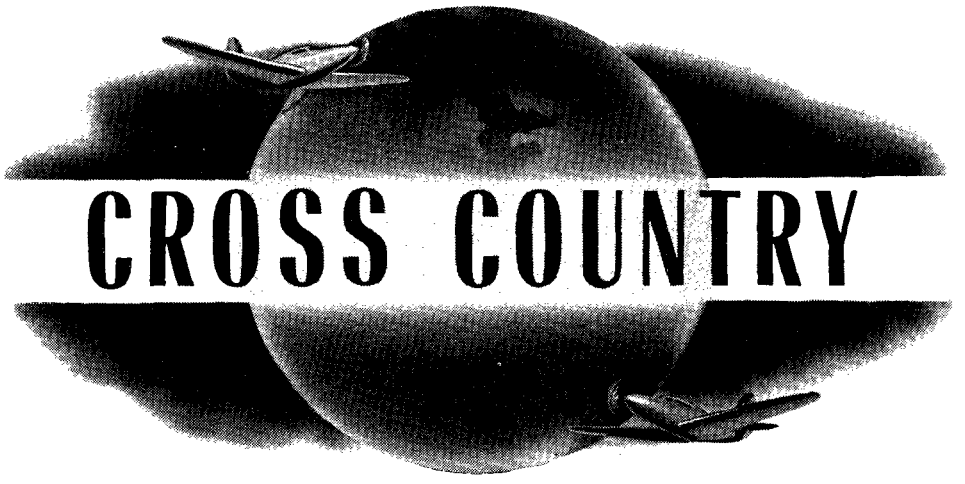


CROSS COUNTRY

A new flight control system and other developments of the month within the Army Air Forces.

THREE or four months from now pilots of the Army Air Forces will have a new kind of service on cross country flights.

Airways Traffic Control centers and communication facilities will maintain contact with all Army airplanes on such flights. They will give pilots complete information on weather changes and on hazards and other conditions which may arise to make continuation of particular flights difficult.

Coupled with this move will be a general standardization of clearance procedures on cross country flights throughout the Air Forces. Officers signing clearances will be required to *know* that the airplane and pilot are thoroughly prepared for the flight to be made. They will be responsible for seeing to it that all information necessary for successful completion of the flight is available and used.

This announcement is based on information provided by the new Directorate of Air Traffic and Safety.

First official notice of these changes was contained in A. A. F. Regulation 20-11 issued early in January. Under its provisions Colonel Sam R. Harris, Jr., the former Director of Flying Safety, became the Director of Air Traffic and Safety, supervising and coordinating the activities of a Director of Flight Control (Lieutenant Colonel George C. Price), a Director of Flying Safety (Lieutenant Colonel James T. Peyton) and a Director of Safety Education (Major Robert L. Steinle).

Flying Safety and Safety Education are activities which had been carried on by the old directorate for some time. Flight Control is a new element.

The new flight control agency is now in process of organization. It will formulate the rules and regulations under which all clearances for cross country flights will be given. It will set up the procedures to be followed, and through an organization of Regional Flight Control officers stationed at each of the 23 Airways Traffic Control centers will see that control tower and flight clearance personnel understand and are enforcing all regulations and procedures.

These Regional Officers will supervise the system of providing information to pilots as they check into specified stations en route. When the situation warrants, these officers will instruct them to land at the nearest airport, proceed to an alternate airport, or possibly return to their point of starting.

While the change represents an extension of centralized control over flying activities, it will affect only cross country flights, including ferrying and cargo flights. Airline operations will not be affected.

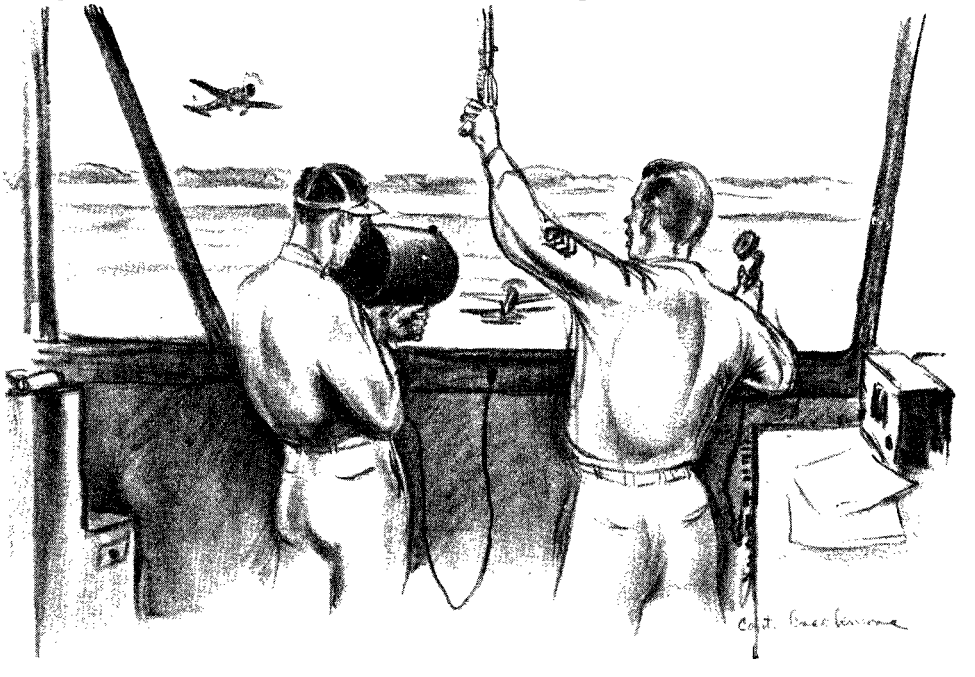
Control tower and flight clearing personnel will be supervised only to the extent of central direction of their procedures and rules for giving cross country clearances, and inspections of their performance. The Directorate will be an allocating agency more than a restricting agency.

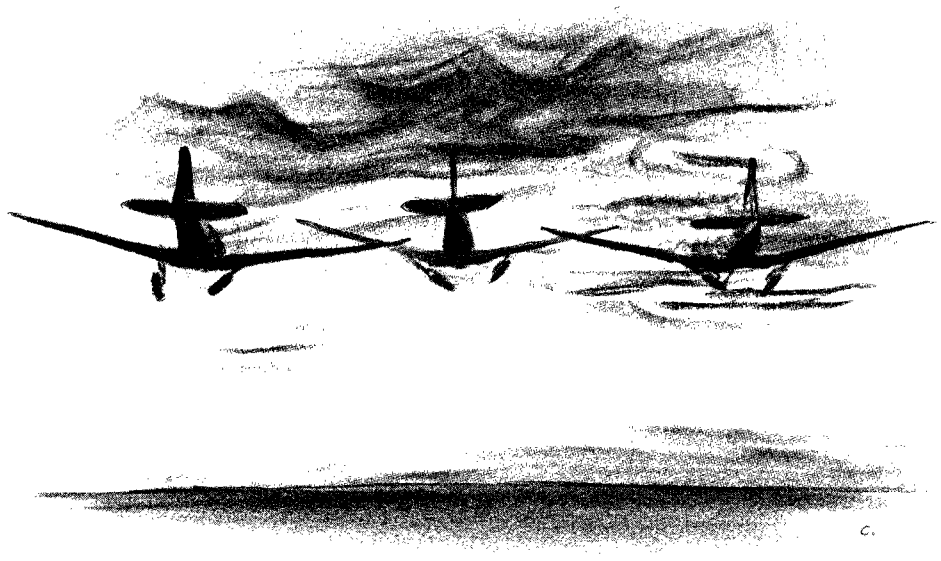
Variations in the amount of control to be exercised in the case of individual pilots will be permitted. A system is being devised whereby pilots with many years of experience will be practically unlimited in their activities. Younger, inexperienced pilots will get more assistance.

For the average pilot, the new flight control will mean that when he gets his clearance he will know definitely that his airplane is ready and equipped for the flight he must make. There will be no guesswork about the routes he is to follow. It will mean that someone else shares with him the responsibility for knowing every condition that he will encounter— fields along his route and every other feature.

When he leaves the operations office he will be informed of the routine procedure of checking with control towers, taxiing, take-off, and traffic patterns to be followed at airports proposed to be utilized on his route. More important, he will know that every other pilot is following the same procedure as he. Flight control will also endeavor to keep him informed of unusual conditions along his route.

The basis for flight control may be found in the accident records and recommendations from the field. It would have prevented an accident such as the one recently involving a B-25, cleared on a cross country flight with a stop schedule en route for gasoline. The flight was at night and the pilot checked over a radio range on his way to a scheduled gas stop. After proceeding about half way





to this stop, he encountered bad weather and turned back to his last check point. But he ran out of gas and cracked up a few minutes after he turned around. The flight was a potential accident the moment it was cleared. Under flight control, the pilot's gasoline supply over the check point would have been known and thus the accident avoided.

A recent flight of B-26s was cleared for a night flight. They arrived at their destination to find that no field lighting or other night flying facilities were available at that field. The first ship landed about the middle of the field or beyond and ran through the fence, ending up on the railroad right-of-way. The second turned around and headed back to its starting point. The third dragged in too low and clipped the tops of several trees, but fortunately was able to land without killing anyone. Proper technical control of operations offices would have prevented this flight being cleared to a field which did not have the necessary facilities.

Another pilot recently cleared a B-24 on a cross country flight. He arrived after dark and on his down-wind approach, just after passing the point where it would have been possible to glide into the field, he ran out of gas. He had about three hours' gas when he took off. He apparently thought he had eight or ten hours. Flight control will require that every airplane cleared has enough gasoline for the flight as planned, plus enough to get to an alternate airport, plus at least forty-five minutes.

While designed primarily as a safety measure for cross country training operations within the continental United States, flight control is also a school for combat. England, like the United States, started the war on a basis of every man for himself. Bitter experience taught the need for standard control and England has it today. Modern combat is impossible without it.

Flight control is a major step in the evolution of the Army Air Forces. Its benefits must be measured in the *safe* completion of *more* Army Flights and thus in more pilots—better trained—for combat.

COLONEL BYNUM walked briskly into one of the barracks at the Harlingen Aerial Gunnery School the other day.

Not a man jumped to attention. They all lounged about writing letters, chewing the fat and sleeping. Colonel Bynum stopped in front of a private who sat smacking his lips over a hunk of fudge from home.

The private looked up disinterestedly. "Hello, Colonel, old boy," he said. "Sit down before you fall down, and have yourself a piece of chocolate."

Colonel Bynum sighed, reached for the fudge and stretched out on a nearby bunk.

Private Colonel N. Bynum is a gunnery student at Harlingen who will graduate soon with wings and a Gunner Sergeant's rating.

AN Information Center has been established by the Air Forces at Eglin Field, Florida, to collect and prepare for dissemination data on the Arctic, desert and tropics as it applies to the specialized operation and care of all Air Force equipment, climate, living and food conditions, ethnological conditions, soil, coastal and interior terrain, water supply, and health and disease prevention.

The new unit will gather and interpret all information now available on conditions in Arctic, desert and tropics, as well as information sent in by military personnel already in those areas. To this will be added information gathered from experiments of the Center.

Requests for information may be sent to the Arctic, Desert and Tropic Information Center from personnel in this country or on foreign assignment, and from other branches of the armed services as well as from the Air Forces. An attempt will be made to answer all requests, *no matter how small.*

Under the command of Lieutenant Colonel H. O. Russel, Headquarters, Eglin Field, Florida, the Center will include specialists such as geologists, physicians and mineralogists, most of whom will be commissioned, and men who have lived in the areas. Personnel from the Center will accompany troops overseas for observation purposes.

The information gathered will be disseminated by answering specific inquiries, by publication of special pamphlets, and through AIR FORCE.

THE Air Surgeon's Office reports that the drinking of fluids before flights to altitudes exceeding 10,000 feet, as well as during such flights, should be greatly restricted. In meals eaten shortly before or during flight to high altitudes, the Office adds, the following foods should be avoided:

Carbonated beverages; all fried foods or food with crusted surfaces; fat meats such as pork or other foods mixed with fat; fresh bread, rolls or cake; navy beans, dried beans, peas and lentils; nuts; raw vegetables, especially onions, cabbage and turnips; dried and raw fruits, except strained orange juice, grapefruit juice and bananas.

WE HAVE read the photostatic copy of a letter from a sergeant in a bombardment squadron on the North African front to an employee of the Glenn L. Martin Aircraft plant, manufacturers of the B-26 for the Air Forces, and of several planes for the Navy and for the British.

Writes the sergeant: "This far away I have heard your factory was shut down. I really hope not and do not believe it."

We don't know where such a rumor started, or if it has spread along the war front to any degree, but we know rumors to be dangerous things and know them to be one weapon of Axis propaganda.

To the sergeant in Africa and to all within eyeshot we are happy to report that the Martin Company hasn't shut down for a minute, and that aircraft and accessory plants throughout the nation are working night and day as never before.

Just for good measure, we quote from a report made recently by Lieutenant General Harry H. Arnold: "We are building overwhelming air power—on schedule. Our monthly airplane production is over 4,000. Our great expansion program now under way will double that output. In 1940 we had in our airframe and accessory plants about 233,000 man employees. Today we have 1,500,000. That explains the tremendous step-up in output of planes and engines."

BASE OPERATIONS at the Air Depot Training Station, New Orleans (Louisiana) Army Air Base, reports several parachutes missing from that office and asks AIR FORCE to request that organizations inventory parachutes at their stations. Should any of the missing chutes be found they are to be returned to Base Operations at the New Orleans station. The chute numbers are: 41-19432, 41-19436, 42-65399, 42-65400, 42-65401, 42-65404, 42-65405, 42-65406, 42-65408, 42-65412 and 65-413.

The Navigation School, Mather Field, California, asks that all Air Force officers

be informed that a Navigation Information Service has been established at that school to which officers may send directly any questions concerning navigation technique, procedures, etc. The Service has grown out of frequent contacts between instructors and their former students concerning navigation problems. Answers to questions will be prepared and forwarded promptly, and all classified material will be properly safeguarded. It is also requested that navigators throughout the Air Forces send to the Service accounts of their experiences which may be of interest to instructors and students at the school. Through the Service, the school believes that considerable help may be given to navigators in the Air Forces and at the same time help the school obtain direct knowledge of problems the navigators are encountering soon after graduation. Thus, steps can be taken immediately at the school to avoid many of these difficulties for present and future students.

These two requests to AIR FORCE lead us to believe that other Air Force units might like to use the service journal in much the same manner. That's exactly what we're here for. By circulating to all personnel, we offer a consistent medium for the exchange between organizations and individuals of requests for information, announcements, "want ads" (at no cost, thank you) such as that for missing parachutes, and the like. In fact, send in enough material and we'll set up a section of the magazine just for that purpose, not unlike the "want ad" section of a newspaper. With the Air Forces growing as it is and spreading out all over the world, we suggest that such a section might serve a very useful purpose. Keep your material as brief as possible, accompany it with the signature of an organization or individual, and we'll try to print everything you send in.

THE Directorate of Communications suggests that the following points might well be put in the form of a posted notice where dispatches are written or received at the code room, or might be displayed on the desk tops of message writers:

1. Use radio only for messages that cannot be sent by other means.
2. Avoid stereotyped *beginnings* and *endings*.
3. Condense wording as much as possible without ambiguity.
4. Incorporate addressee and originator names in the text.
5. Avoid repetition of words or phrases; use synonyms.
6. Ask the cryptographic officer to assist in paraphrasing; initial approved text.
7. Write numerals where accuracy must be assured (each digit or primary number as one word). Example: Write "24 men" as TWO FOUR MEN, *not* TWENTY FOUR MEN.
8. Use the phonetic alphabet (p. 56 FM 24-10) for difficult expressions with letters as well as numerals.

FOR what it's worth, we offer an unofficial report from the Middle East that Germany's Heinkel 111 bomber, with full crew and equipment, can haul exactly 6,400 cans of beer. That contribution to the science of logistics was furnished by Allied airmen who recently captured a Heinkel. Exactly how much captured German beer Allied airmen can carry is a matter of speculation, and enviable speculation, too.

EXCEPTION has been taken to a sentence in the article "Single Engine Operation" by Lieut. Colonel J. B. Duckworth, Columbus Flying School, which appeared on page 14 of the December issue of AIR FORCE. The sentence read: "The ship can be banked steeply into the dead engine and be as solidly controlled as though both were in use." (This discussion involved the necessity for adequate airspeed when flying a twin-engine plane and one engine fails.)

In explanation, the sentence was contingent upon that immediately preceding, which stated: "If a rate of 30 or 40 miles per hour over the minimum single engine operating speed is maintained, no loss of control can result." The meaning: that if adequate airspeed is maintained, the ship could *even* be banked steeply into the dead engine, etc.

Considered by itself, the sentence objected to might indicate that turning into the dead engine in single-engine operation of multi-engine aircraft was recommended. This was certainly not the case. In such operation, whenever possible, the pilot should turn toward the good engine and keep the dead engine up, never down.

FOR maximum effectiveness, AIR FORCE must circulate throughout the Air Forces, spread around the world. If the ratio of distribution in this country is not maintained in ensuing months, you will understand that it is because we are making every effort to keep pace with the movements overseas and get AIR FORCE in the hands of the boys on foreign duty—even to the remotest island outpost. Whatever the changes involved there will be plenty of magazines distributed monthly for all to read. This will depend, to a great extent, on your seeing to it that AIR FORCE is spread around. Letters keep coming in asking that names be placed on the mailing list. We repeat, there is no mailing list. Our only method of circulation is through bulk shipment. We depend on message centers for equitable distribution at individual fields. And, we depend on you to keep AIR FORCE moving.—THE EDITOR.

From Numbers to Names

Below is a listing of names (by the numbers) accorded official recognition by the Army and Navy as popular designations for American aircraft. For official use within the Army Air Forces, numerical designations will be retained. (Navy symbols are shown in parentheses):

HEAVY BOMBERS

B-17	Flying Fortress
B-24 *(PB4Y)*	Liberator

MEDIUM BOMBERS

B-18	Bolo
B-23	Dragon
B-25 *(PBJ)*	Mitchell
B-26	Marauder
B-34 *(PV)*	Ventura

LIGHT BOMBERS

A-20 *(BD)*	Havoc (Attack)
A-24 *(SBD)*	Dauntless (Dive)
A-25 *(SB2C)*	Helldiver (Dive)
A-29 *(PBO)*	Hudson (Patrol)
A-34 *(SB2A)*	Buccaneer (Dive)
A-35	Vengeance (Dive)
(SB2U)	Vindicator (Dive)
(TBD)	Devastator (Torpedo)
(TBF)	Avenger (Torpedo)

PATROL BOMBERS *(Flying Boats)*

OA-10 *(PBY)*	Catalina
(PB2Y)	Coronado
(PBM)	Mariner

FIGHTERS

P-38	Lightning
P-39	Airacobra
P-40	Warhawk
P-43	Lancer
P-47	Thunderbolt
P-51	Mustang
(F2A)	Buffalo
(F4F)	Wildcat
(F4U)	Corsair

SCOUTING OBSERVATION

(SO3C)	Seagull
(OS2U)	Kingfisher

TRANSPORTS

C-43 *(GB)*	Traveler
C-45A *(JRB)*	Voyager
C-46 *(R5C)*	Commando
C-47	Skytrain
C-53 *(R4D)*	Skytrooper
C-54 *(R5D)*	Skymaster
C-56 *(R5O)*	Lodestar
C-61 *(GK)*	Forwarder
C-69	Constellation
C-76	Caravan
C-87	Liberator Express
(JR2S)	Excalibur

TRAINERS

PT-13 & 17 *(N2S1 & 3)*	Caydet
PT-19 & 23	Cornell
(N2T)	Tutor
PT-22 *(NR)*	Recruit
BT-13 & 15 *(SNV)*	Valiant
AT-6 *(SNJ)*	Texan
(SNC)	Falcon
AT-7 *(SNB2)*	Navigator
AT-8 & 17	Bobcat
AT-10	Wichita
AT-11 *(SNB1)*	Kansas
AT-13 & 14	Yankee-Doodle
AT-15	Crewmaker
AT-19	Reliant

LIAISON

L-1	Vigilant
L-2	Taylorcraft Grasshopper
L-3-C	Aeronca Grasshopper
L-4-B *(ME)*	Piper Grasshopper
L-5	Sentinel

NOTES from North Africa

North African bombing pattern.

Sidelights from an airman's report on living and fighting conditions in the desert theater of operations.

MUD AND MORE MUD. From Casablanca to the front is almost 700 miles and the road network—both motor and rail—is none too good. You are forever being impressed by the distance from one point to another, probably because there is nothing in between but—mud.

In America you can lead a not too sheltered life and in ten years not get stuck in the mud. In North Africa ten minutes is your limit. Everything gets stuck—trucks, planes, feet. Half the operational difficulties of the area can be traced to mud.

EATING AND SLEEPING. There is no answer to cover everyone. Plane crews sleep in their planes, ground crews sleep in tents at oases, in hotels, barracks, anywhere. You eat American rations as far east as Algiers, from there on, British. With the British you drink hot tea and wine. Water isn't always safe. British rations aren't bad; there's sure to be some kind of meat stew.

In the towns and cities—such as Algiers—the Air Force has taken over hotels. Some of them are fine, most not bad. The service is fair; occasionally there is hot water. When the word gets around that the taps are running warm, everybody dashes for the soap and towels. It is not unusual to see a colonel—who has an intelligence system in good working order—drop everything and run for home to get his first bath in a week.

There is nothing to complain of so far as the hotel food is concerned. You get a yen for a piece of red meat occasionally, and green vegetables are scarce, but you get fed.

Breakfast costs thirty francs, lunch forty. A franc is worth 1¼ cents. You change your money into francs very easily, but American Export dollars are good anywhere. These are regular U. S. bills with a yellow seal stamped on them, to the right of the portrait.

THE FIGHTERS. The P-38s have come into their own in North Africa. They do everything. They are used on air defense patrols of Allied strong points, over areas of concentrations, for ground strafing against troop columns and armored equipment, for minimum altitude attacks against surface vessels, and for escorting heavy and medium bombers on missions.

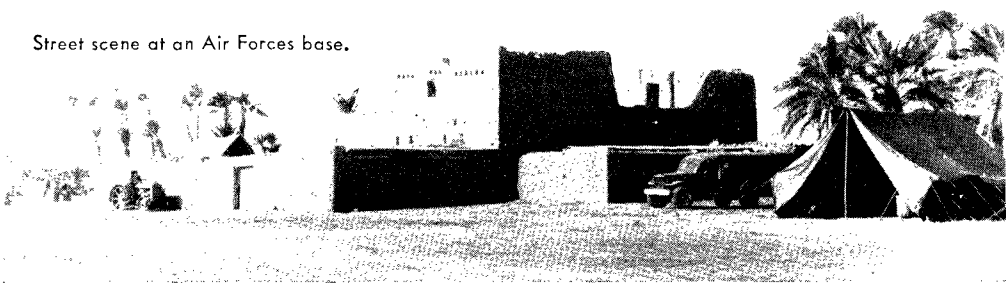
You can hardly find an assignment which P-38s cannot carry out. They escort our bombers 500 miles out and in—as far as the bombers go. They can carry two big bombs and drop them where they do the most good. They are also used for photographic reconnaissance and as weather ships.

The fighter pilots have tough work. Day after day they fly escort duty at 30,000 feet, using oxygen all the time, hour after hour. But they are sold on their ships.

The commanding officer of a heavy bombardment group in the North African theater said he would stake his tactical reputation on the fact that the P-38 is the greatest fighter ever built. "Other fighters are better at certain things, but the P-38 is the best all around ship," he said.

MONEY MEANS NOTHING—in the back country. There is the story of the Air Force corporal who wanted to buy some tangerines. He had the dough, and was willing to pay whatever was asked. But the natives would have none of his money. They kept pointing to his shirt and his pants. He caught on, of course, and went back to his tent to see what he could dig up. His supply of clothes was no more than adequate, and he knew everything he owned was precious. Finally he decided to part with his barracks bag. He brought it out. The

Street scene at an Air Forces base.



natives eyed it for a long time, fingered it, and then handed it back. It meant nothing to them. Then the corporal took his knife, cut a couple of holes in the bottom of the bag, slipped a native's legs through, pulled the bag up and tied it tight around the chest. The native was delighted.

The corporal got four bushels of tangerines.

Everybody eats tangerines all the time. You carry them in your pockets and bags and keep them in your room. In the cargo planes there is always a crate open for anyone to dip into.

THE BOMBERS are doing a great job. Morale is excellent among the crews. The fact that the crews were trained in England on combat missions accounts for the smoothness of operations.

The crews on both the light and medium bombers are developing a much more efficient degree of crew coordination. There seems now a strong possibility that crews will be returned here intact—with the same plane they flew in the wars—to instruct.

The Germans aren't taking anything lying down. Their defenses are excellent; plenty of ack-ack gets up to high altitudes. They're throwing a lot of 88 mm stuff at us. But nothing is interfering with our accuracy.

One fortress came home with an 88 mm hole in a wing between the motors. It was a clean hole—the shell had gone through and exploded above—and if you looked carefully you could see the shell rifling on the metal of the wing.

It has become general practice for crews in medium bombers to wear helmets and big goggles, so that if the windshield is shattered by flak or anything else they will not get hit by flying glass.

Of all the legends and cracks and mottos that are painted on planes the best seemed to be this: Over the rear gunner's compartment in a B-17 was a picture of a pair of dice, with a seven showing. And these words, "Shoot. You're faded."

AN INCIDENT occurred one day at a heavy bomber field which scared the boys a little. A Heinkel heavy bomber apparently got lost, and after circling the field, came in, made a normal approach up wind and landed. The ship, of course, was immediately taken over and the pilot was a very surprised fellow to find that he wasn't in German territory. What scared the boys was that all the enemy's maneuvers hadn't aroused any suspicion.

Flying low over the veldt, a young lieutenant-colonel, from the nose of a B-17, had his eyes wide open at a collection of zoo animals galloping under him—giraffes, zebras, deer, etc. Finally he spotted a buffalo, African variety, and could no longer resist. He let loose with a burst from his nose gun. The buffalo took off.

A general was sitting in the plane, soberly watching what had been going on. After the burst he nodded slowly and spoke

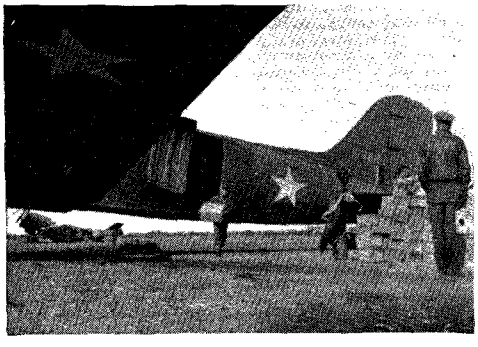
These are the notes of an Air Forces officer just back from an inspection tour with the Twelfth Air Force in North Africa.

to the hunter. "Colonel," he said, "the buffalo is a powerful animal. But the 17 is a good ship. I think you have about an even chance against him."

THE CARGO PLANES. Those boys of the Troop Carrier Command are doing a hell of a fine job. They are doing all the air transport in the area, moving, with their C-47s and C-53s, everything that gets moved—equipment, supplies, personnel. They fly—escorted by fighters—from Casablanca right up to the front line airdromes.

They can never rest. They must fly continually under all kinds of handicaps, in and out of small, bad fields. Nevertheless, they show a minimum of accidents and maintain their planes excellently under hard field conditions.

Example: For the Airborne Engineers the cargo boys carried personnel and equipment from Casablanca to a small field far in the interior. This was within a short distance of a drome which it was hoped could be used for heavy bombers. The Engineers—with their miniature bulldozers and their scrapers, jeeps, rollers and graders—put the field in shape so that a B-17 landed *four days later*. The cargo planes got the bombers there.



Unloading emergency rations from a C-47.

WEATHER, NOT A CLIMATE, that's North Africa. It's good for a week, then bad for a week, which means that you fight hard for a week, then take it easy for a week. Of course, you don't really take it easy, you have no time off. You eat and sleep with the planes, and very often repair them as well.

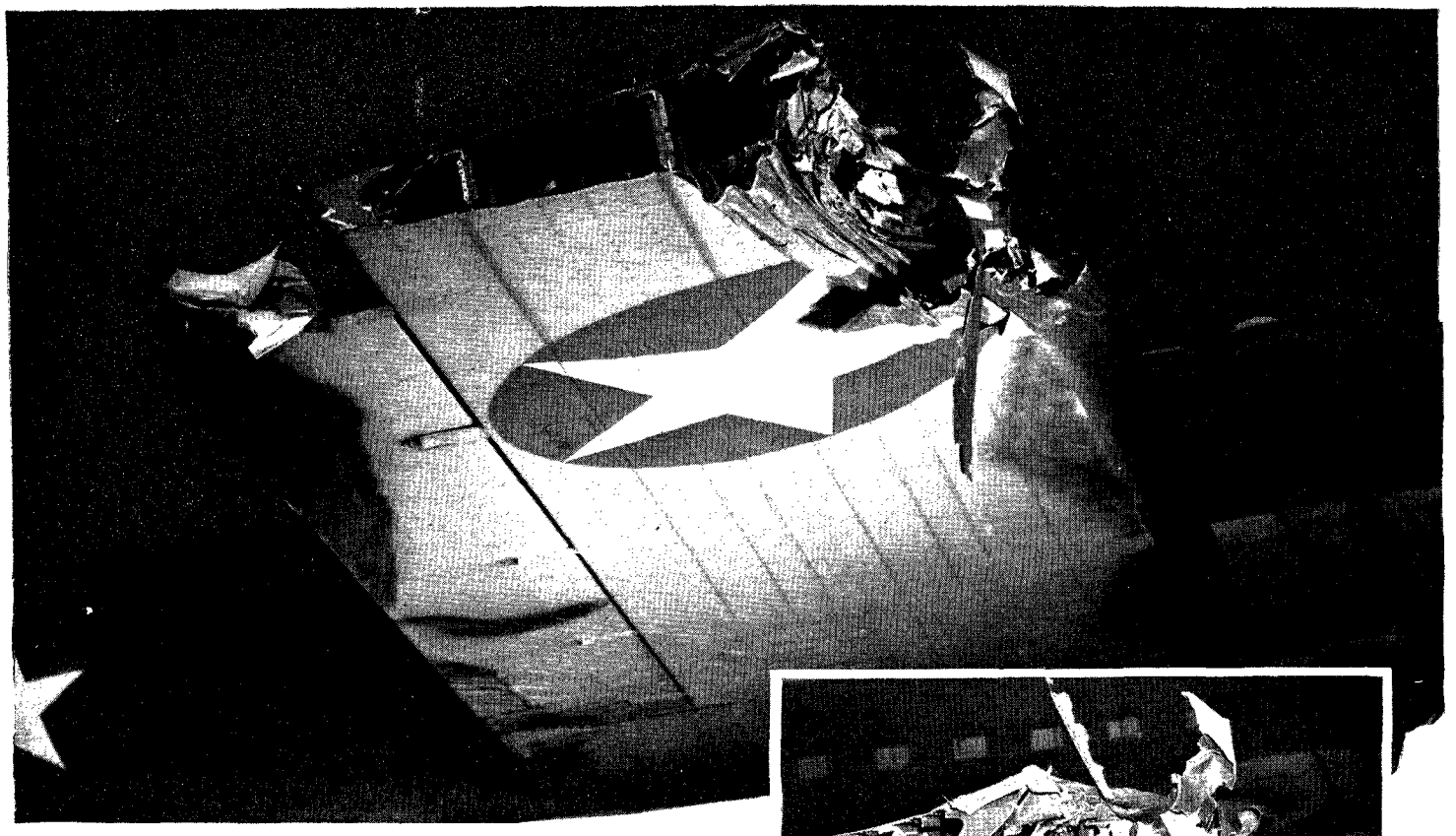
It's cold. Algeria is in the same latitude as North Carolina but without benefit of the Gulf Stream. If you're moving into the area take winter uniforms—and a bedding roll. Take all the uniforms you are likely to need, for when a blouse wears out, you will have to keep on wearing it. Shoes are a big problem. Thin soles are no good at all; the thicker the soles the better. Galoshes will help.

THE ARAB is a quiet type. However, if you make an effort he will respond, and he seems pleased to talk. The Arabs have finally got the idea that we are temporary visitors and mean them no harm. On the whole, relations with the French and the natives are satisfactory. There is very little trouble.

The standard horror story of what the natives did to a couple of the boys who made passes at their women has been thoroughly spread around, so all is quiet on that front. And in any case, the native women don't bear what you would call a striking resemblance to Hedy Lamarr.

GETTING HOME doesn't take long. You can leave Africa one day and be in Washington the next. Good flying—7200 miles in 44 hours, or 164 miles an hour, including three stops. ☆

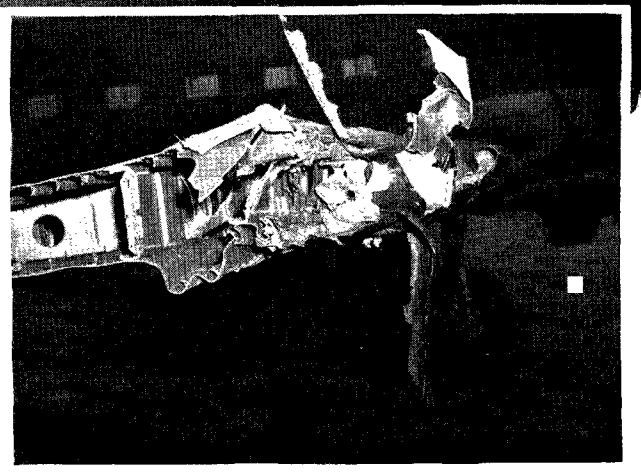
Tripoli Harbor during a daylight raid by B-24s.



KEEP ALERT AND KEEP ALIVE

By Colonel Sam R. Harris

DIRECTOR OF AIR TRAFFIC AND SAFETY



With thirteen feet of wing missing, this ship landed safely

EN ROUTE to Wichita from Stout Field in a C-53, Captain L. H. Penn of a troop carrier squadron was about five miles from Kansas City at 4,000 feet and entirely on instruments when a violent crash threw his ship into a steep spiral. He knew something had hit him but he didn't know what. The crew got orders to prepare to jump.

Straight and level flight with a perfect airplane is one thing. Pulling a damaged ship out of a spiral on instruments is another. But it worked. The crew of six men didn't jump.

In less than one minute, Captain Penn had established contact with the Kansas City radio. He asked for weather at the airport and warned that he was coming in for an emergency landing. Other ships in the air nearby were sent away from the immediate vicinity and a commercial airliner ready to take off was held on the ground.

Coming out of the overcast at 1,500 feet, Captain Penn found himself north of the airport. In order to avoid a longer turn to the left, he turned the ship to the right despite a damaged right wing. Wheels down and under control, the ship landed safely. Once on the ground, Captain Penn discovered that he had collided with a commercial airliner which crashed in a field a short distance away, all of its occupants escaping injury.

Thirteen feet of Captain Penn's right wing had been torn away, along with a portion of the aileron surface.

This was a beautiful job of flying. Those moments immediately following the crash were probably the busiest that Captain Penn has ever known, but he moved from one job to the next and refused to get panicky.

THERE are more planes over the United States today than ever before. Because more of them are equipped for it and more men have been trained to do it, there is bound to be more flying in "instrument weather." This means greater exposure to collision accidents.

Obviously, it is impossible to describe in advance exactly what techniques should be used in the event of collisions. In fact, in 999 cases out of 1,000 the thing to do is jump.

The best treatment for these accidents, like all others, is to prevent them from happening. Standardized control throughout the air forces is one long step in that direction. As for the pilot, prevention requires rigid adherence to flight plans—especially to assigned altitudes. By rigid adherence is meant staying within a plus or minus 50 feet of the assigned altitude *all the time*. It can be done by any normal pilot who is on his toes and doing a real job of flying.

Rigid adherence to flight plans also means instrument flying—even under contact flight rules. Modern operational equipment has outgrown the seat of anybody's pants. Your instruments are geared to your equipment. The seat of your pants is not.

Pilot error is still by far the greatest cause of accidents in the Army Air Forces. Alert, clear-headed action and skill such as that demonstrated by Captain Penn will reduce that percentage and with it the list of needless casualties in men and equipment this side of actual combat. ☆

A Jump Ahead of the Jerry

By Major Carroll W. McColpin

U. S. Army Air Forces

Personal experiences of an American fighter pilot during 250 operational hours with the R.A.F. over Europe.

WE knew long before we reached Britain on that crossing back in January, 1941, that things were going to be plenty hot in the months to come.

There were thirteen of us in the first group lined up by a New York committee to go over and give the R.A.F. a hand. Great Britain already had been blitzed from hell to breakfast and the shows over there were still hot and heavy.

We thought we had a fairly good idea of what was coming but we were undershooting.

Of the thirteen, only two of us are still pitching. One of the boys is an instructor in England; and I'm in operational flying for the Army Air Forces. Of the others, a few got out as the months went by but most of them didn't come back.

AIR FORCE has asked me to pass along a few personal experiences in the hope that some idea of what combat against the German *Luftwaffe* is like might be gained from them. Although in this article I must necessarily speak only for myself, it might be borne in mind that my experiences, in many respects, have been duplicated hundreds of times in the R.A.F.

I had about 300 hours in light stuff under my belt before I went across, which meant that my principal training in Britain consisted in gunnery practice and other phases of O.T.U. The training period lasted six weeks, including forty hours in the air and about sixty hours of ground duty.

The R.A.F. was surprisingly lenient with us. The ground courses were not mandatory. Most of the fellows seemed to realize that if we didn't choose to take all the instruction and tips they offered, it would be our necks—nobody else's. That's the way the R.A.F. felt about it.

I took all the training they dished out. And I'm here to tell you, I'm damned glad I did. You can't get too much training in this business.

During the latter part of March, I made my first operational flight—with a British squadron, of course. We were flying Hurricanes then. That first flight was a patrol over the North Sea at night. We were flying at from twenty to fifty feet over the water because that was about the altitude the German bombers usually came in. We didn't spot anything and, all in all, my debut was uneventful, but for the first time I started to feel like I was really doing something.

I flew with British squadrons on ten or twelve sweeps across the Channel from then until about the middle of May, 1941.

We knew our Hurricanes from nose to tail. We knew the Messerschmitts were faster; we could never catch them, nor could we run away from them. They could outclimb and outdive us. But they couldn't outmaneuver us. This we knew—and knew well.

So we played the game with our best weapon—maneuverability.

The Germans in ME-109Es usually would be waiting for us at 32,000 to 35,000 feet. We would go in at about 28,000 or 30,000 and wait for them to come down for us.

Soon they'd come, diving in at about 600 miles an hour, one after the other. But by the time they were set to open up we wouldn't be there. We'd go into a steep banking turn and come about in the hope of getting a squirt at one of them as he went by.

We didn't get many that way (I didn't get any), but they didn't get us either. Those Hurricanes were the toughest fighters in the air. I saw one come home with all but eighteen inches of prop blade blasted off, ailerons and wings shot to hell and more than 100 holes in the fuselage. During the British retreat before Dunquerque, they used wings of shot-down Hurricanes time and again as bridges across ditches in moving trucks and heavy (Continued on Page 37)

HERE COME THE AIRBORNE

By Brigadier General Fred S. Borum

COMMANDING GENERAL, FIRST TROOP CARRIER COMMAND

AMERICA'S airborne troops are in the news.

During the assault on North Africa parachutists were flown 1,500 miles nonstop from England to attack Oran. This was the longest air invasion on record.

During General MacArthur's drive in New Guinea our planes carried combat units deep into the jungle and dropped tons of food and ammunition to our troops to help humble the Jap.

These were impressive successes. But they are a mere hint of things to come.

A preview of America's airborne strength was held in Texas late last fall. These maneuvers were the first of their kind ever attempted by the U. S. Army and the results were significant.

The basic military problem was as follows:

Hypothetical enemy forces had crossed the Rio Grande from Mexico and driven a wedge into Texas, occupying three airports. Two of these fields were near Eagle Pass and Del Rio, forming a base of the wedge along the river, while the point of the triangle nearest our forces was at Bracketville.

Theoretically, the enemy held these positions with strong units of infantry supported by field artillery of all calibers, and by air forces, machine gun companies, antiaircraft and engineering and service groups.

Our forces opposing the enemy were concentrated outside San Antonio.

They consisted of selected units of parachute troops and an infantry task force of the Airborne Command, 2nd Infantry Division, all under the command of Major General Walter M. Robertson, commanding officer of the 2nd Division.

With these troops were two groups and a glider-equipped squadron of the Troop Carrier Command, Army Air Forces, under the command of Colonel Maurice M. Beach. They flew twin-engine aircraft of the C-47 and C-53 types. (Structural differences between the types are slight.)

Bracketville's "enemy-held" airdrome was the first objective.

Attack upon this base, as upon others that followed, fell into four main phases. Imagine yourself at Bracketville, observing the operation. Assume that the field has already been heavily bombed, as would be the case, when possible, in real warfare.

The Author.

First come the paratroopers. Planes fly over Bracketville at a low level and drop the "umbrella men" to seize and hold the airfield. After a sharp engagement, they gain control and immediately set up radio communications. By this means, together with pyrotechnics and ground panels, they direct incoming transports to landings on the field.

THIS is the second phase—the deplaning of airborne infantry and the unloading of jeeps, trailers, motorcycles, artillery pieces, ammunition and supplies. As quickly as they are emptied, the planes take off again for fresh loads; this procedure continues throughout the day, even into darkness.

Third phase of the pattern of attack comes on the second day and is primarily a problem of re-supply and consolidation. Food and ammunition are dropped by bright-colored parachutes. Additional men and pieces of equipment are brought in.

Here the gliders play their part. Towed by large camouflaged aircraft, the huge motorless ships are quickly cut loose, landed and parked at the unloading area. From each glider rolls a jeep under its own power, rapidly followed by armed men.

Fourth and final phase of the operation is the evacuation of casualties—stretcher cases and walking patients alike—to be followed, ultimately, by complete evacuation

TROOPS!

How we are applying the military science of transporting our men, weapons and supplies by air.

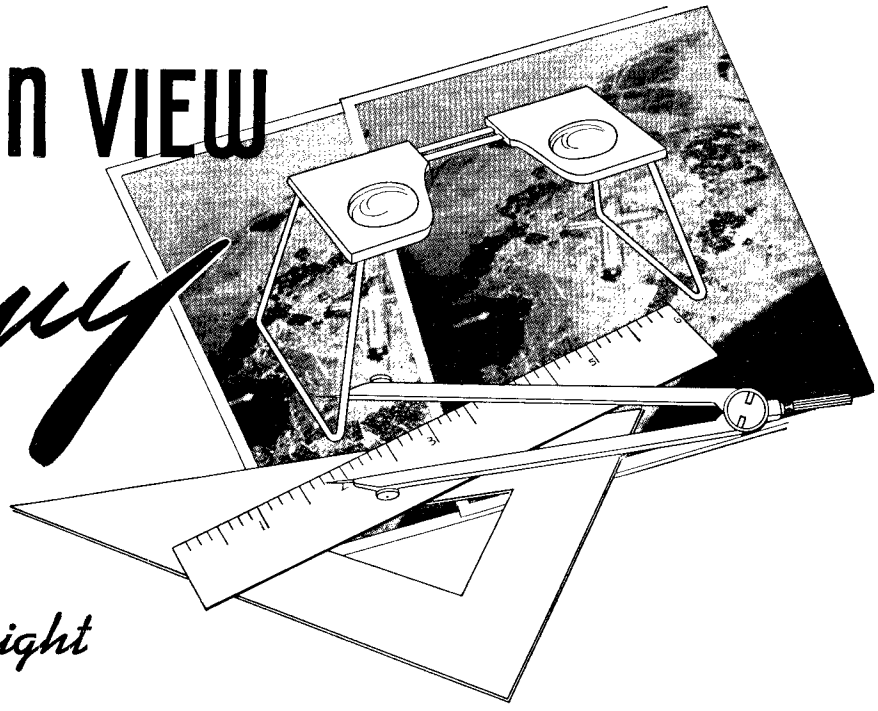
uled far in advance of dawn and the day's work of flying did not end until long after sundown. Men and machines were both taxed to the limit; both stood up incredibly well.

Flying continued under varied conditions,

Though a relatively new division of the Army Air Forces, the Command already has units operating all over the world. The 1st Troop Carrier Command has its headquarters at Stout Field, Indianapolis, Indiana.

Squadrons are the basic tactical units. To

THREE-DIMENSION VIEW OF THE *Enemy*



By Captain L. B. Wright

HEADQUARTERS, ARMY AIR FORCES

Advances in aerial photography and photo interpretation make the camera a superhuman military observer who is seldom, if ever, fooled

WHEN the Japanese took Kiska Island in the Aleutians they tried to make our forces believe that they had considerable aircraft strength by creating outlines of dummy aircraft on the ground.

This did not fool our photo interpreters for a minute. Our own aircraft had taken pictures—aerial pictures which at once revealed the ruse.

Aerial cameras have become the superspies of modern war. Accurate knowledge of the enemy's strength, disposition and movement, and even his probable intentions, may be obtained by the aerial camera on a scale never remotely approached by the secret agents of other wars.

This has been made possible by three-dimensional photography technique and the relatively new science of photo interpretation, which constructs, from pictures brought back by a reconnaissance plane, a full and significant story.

Dependable interpretation relies upon a third-dimension view. Aerial photographs, viewed singly, provide only two dimensions. Since they give no sense of height, flat objects on the ground may be confused with buildings, innocent soil patterns take on the appearance of gun positions, and many objects—such as built-up roadways and levees, radio towers, power houses and transformer stations—may be missed altogether.

An aerial observer, flying over terrain at an altitude of a few thousand feet, can detect the relative height of objects. But the ability to do this diminishes as he gains altitude. The distance between the pupils of a man's eyes is approximately 2¾ inches; at great altitudes ground objects are viewed, in effect, from the same position by both eyes. Thus, the stereoscopic effect which enables man to recognize differences in elevation is eliminated. If the eyes could be spread apart, the difficulty would vanish. Impossible as that procedure is, a photographic method of accomplishing the very same thing has been developed.

An aerial camera is mounted in a reconnaissance plane to record vertical pictures of the ground. Two photographs are taken from different stations in such a way as to include part of the same terrain in each.

This results in two perspective views of the same land which, when viewed so that the left eye sees only the left photo and the right eye only the right photo, a perception of depth or third dimension is readily apparent.

MANY mechanical and optical devices have been built for the purpose of viewing stereoscopic pairs of overlapping photos of the same terrain, but the simplest and most commonly used is the pocket stereoscope. This instrument is similar to the old parlor stereopticon that provided so much fun in the "Gay Nineties."

Obviously, the aerial camera, utilized in this way, eliminates the human failings to which an observer on a reconnaissance flight would be subject and which would lessen the accuracy of his observation.

For instance, if he were to fly over hundreds of miles of terrain, his memory could not cope with all the manifold details of the ground below. If the plane were attacked by hostile aircraft, evasive action would undoubtedly be necessary and, in the excitement, scant attention could be given to observation.

The aerial camera, on the other hand, has an unfailing and capacious memory and yields a true visual record, in the minutest detail, of terrain over which the plane has flown.

A series of pictures obtained on reconnaissance might reveal, let us say, an armored column. The type of the column would be readily discernible, provided the scale of the photographs did not exceed 1/10,000. The speed with which it was traveling could be estimated by the spacing of the vehicles, the direction of travel by the position on the highway, and the strength by the number of each type of vehicle in the column.

Countless cases might be cited where three-dimensional photography has played an important role in the war.

For example, in the case of the Japs at Kiska, it was obvious from examination of photographs through a stereoscope that the dummy installations were flat, quite unlike actual aircraft. And, by counting and measuring the number of buildings erected and determining the height by means of a mechanical device known as the "Abrams Contour Finder," the quantity of supplies and strength of occupation could be estimated quite accurately.

The possibilities of obtaining intelligence data through photographs are virtually limitless.

Oil storage capacity may be determined with reasonable accuracy by measuring the diameter and height of oil tanks. The height and size of troop barracks is a good clue to the number of troops that can be housed in each building. By the elevation differences between gun positions and the surrounding terrain, the enemy's field of fire may be ascertained.

As a matter of fact, it would not be out of the question to plan an entire campaign from a stereoscopic study of terrain as revealed in modern aerial photographs.☆

What's your AIR FORCE I.Q.?

IN THE interest of variety, AIR FORCE presents this month's Quiz in picture form. The following scoring method was set up by a very harsh teacher who hasn't munched an apple in months: eight out of twelve is passing; nine correct is a good score; ten is excellent; score eleven or round out the dozen and you're eligible for second helpings of everything, including promotions. Open your eyes and give it a try.

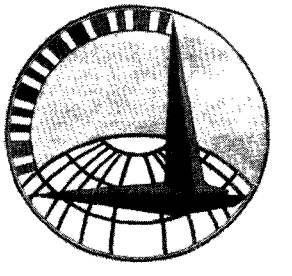
Answers on Page 36.

1. The award shown above is the

a. D.S.M. c. D.F.C.
b. F.O.B. d. D.S.C.

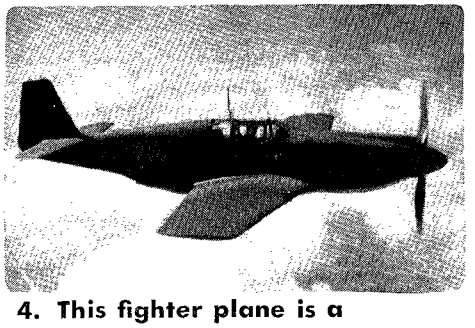
2. This Air Force General's name is

a. Brett c. Spaatz
b. Doolittle d. Brereton



3. What Command insignia is this?

a. Air Service c. First Fighter
b. Materiel d. Air Transport



4. This fighter plane is a

a. P-40 c. P-39
b. P-51 d. P-47

5. You should identify this as a

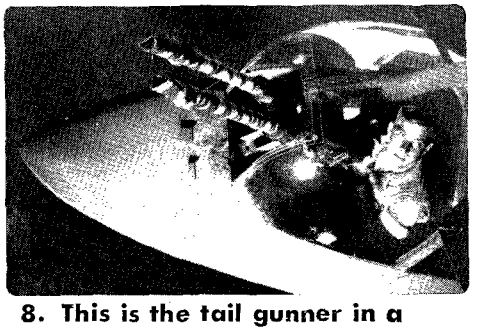
a. P-47 c. Zero
b. AT-6 d. Wildcat

6. Above you see a

a. Focke-Wulf 190 c. Airacobra
b. Hurricane d. Messerschmitt

7. The sergeant here is using a

a. Flare gun c. Traffic signal
b. Camera d. Sextant



8. This is the tail gunner in a

a. B-17 c. B-26
b. B-25 d. A-20

9. This officer is looking into a

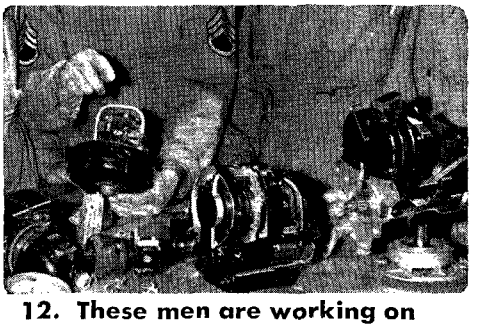
a. Camera c. Bombsight
b. Drift meter d. Bank indicator

10. These men are directing a

a. Blind landing c. Control tower
b. Link trainer d. Radio beam

11. The ammunition shown here is

a. 20-mm c. 37-mm
b. 50-calibre d. 30-calibre



12. These men are working on

a. Carburetors c. Starters
b. Magnetos d. Pistons

We Keep 'em Firing

By Major J. B. Morris

ELLINGTON FIELD, TEXAS

New target-towing techniques provide simulated combat conditions for gunnery and anti-aircraft personnel

TOW target work is an exciting and highly specialized function of the Army Air Forces.

Once, the most antiquated ship at hand would be assigned to towing. Targets were "snaked" off the ground on a long steel wire attached to the plane's tail and stretched to the far end of the field and back again before a take-off. What happened when the plane left the ground is obvious. The wire generally became taut just when the pilot needed most of his power. A lot of the gray-haired flyers you see were once tow target pilots.

Now, the "sock is dragged" by fast ships and the targets are paid out on a cable by a mechanical windlass—after the plane is in the air.

So great is the need for moving aerial targets, particularly by anti-aircraft units of the Coast Artillery, that the Air Forces now maintain full squadrons whose sole mission is to fly cylinders or "flags," or to serve themselves as a target in the night for Army ground units.

This is no dull, drab, boresome work. Target pilots spend their time being fired on 24 hours a day—fired on by everything from .30 caliber machine guns to rapid-firing "Biggies" that deliver high explosive shells—and they get to feel like sideshow performers dodging baseballs.

In the anti-aircraft training program, tow target missions fall into three broad classifications: tracking, searchlight and firing.

Tracking missions are performed in small ships which fly at a pre-determined altitude and over pre-determined courses. Anti-aircraft fledglings on the ground learn to follow the ships with sound locators, and later, with guns. Searchlight flying is about the same, done at night.

On one of these searchlight missions with the Fifth Tow Squadron at Ellington Field, you approach the searchlight battery from various angles and from a blackness that cannot be described. The pilot, crouched in the cockpit, flies by instruments or, as he terms it, "riding the gauges." You execute every maneuver the bomber can accomplish in an attempt to get out of the lights, then go out to start over again. Never flying outside a 25-mile area, you will have traveled —at the end of three hours or so—as far as from Los Angeles to Portland.

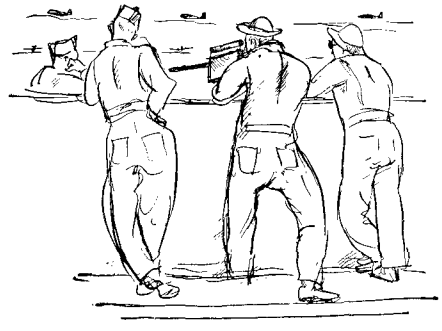
FLYERS are never kept at this work long enough to get stale, for, after a few nights of it, they are the best night bombing pilots you can find.

Daylight towing for firing purposes demands the utmost in skilled precision of a crew.

The same bomber is loaded with an assortment of targets called "sleeves" or "flags." They are of various sizes and styles, to be used according to the type of guns being fired, altitude, sky conditions and other factors. The crew consists of pilot and co-pilot, radio operator, flight engineer and two reel operators.

The firing point and radio contact have been established with the anti-aircraft batteries on the ground. Then come the instructions.

"You will launch a B-14 target, red, and fly a clockwise course at 2,000 feet and tow with 1,800 feet of cable."



The pilot slows down the ship to minimum speed and, as it nears the stall point, gives orders to launch the target. Then, quickly, he closes the throttle and noses sharply down. This maneuver is to get up tail, thus giving better clearance for the target, and to regain speed without blasting the sleeve with propeller wash.

Attached to a cable, which is wound on a windlass, the bundle catches in the slipstream and opens into a red cylinder. (The target had been folded and wrapped with light yarn like a sailor stops his spinnaker.)

When the windlass operator has played out the required footage, you are ready to start the actual towing for fire. You fly in a continuous circle, passing the firing point about 200 yards from the anti-aircraft batteries. As they open up from a scant 2,000 feet below, it is a vivid experience to realize that they are firing at you.

There are, of course, elaborate safety precautions and, to date, no plane has ever been hit.

After a period of towing at this level, you are ordered to replace the "sleeve" with a "flag"—a large wire screen device forty feet long and nine feet high. This target requires 2,400 feet of cable and you are told to climb to 10,000 feet. These will be the "Biggies."

Up at 10,000 feet your technique is entirely different. Here you make runs of ten miles or so.

Sit in the tail gunner's seat; watch the tiny smoke-puffs from the batteries far below; see them burst accurately into the "flag" being towed several seconds later; see the "flag" soon torn to shreds, and you get a much better idea of the gunnery training our Army is receiving. ☆

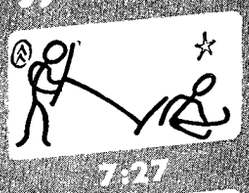
"ACL IN A DAY"

Around the clock with a Student Mech

By Private David F. Pierce

Casey Jones School of Aeronautics, Newark, N. J.

7:25 A. M.



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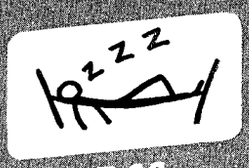

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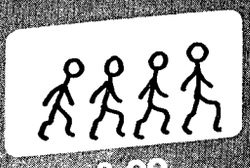

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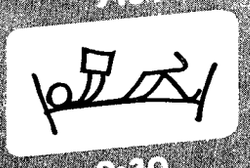

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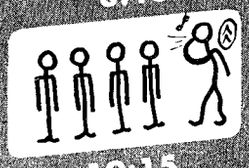

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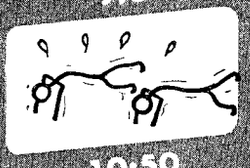

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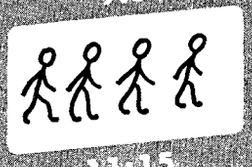

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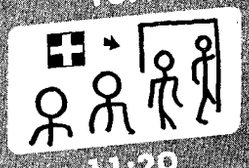

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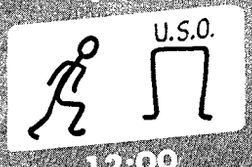

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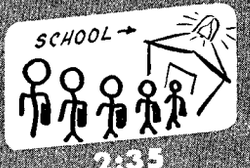

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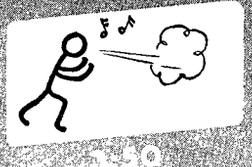

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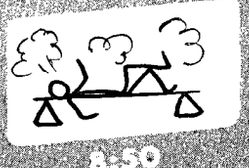

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TRAIN BUSTING

The New Art of Wrecking Nazi Rail Shipments

As told by an RAF pilot to J. D. S. Alan, Correspondent, London Sunday Dispatch

NIGHT and day great French locomotives rumble and thunder across Northern France, each drawing hundreds of tons of goods and war machines at the behest of the Germans.

They carry food, fabrics, and wines for the Herrenvolk, and French-made tanks, aero and lorry engines, and guns for the Russian and North African fronts.

They carry guns and cement for the fortifications fronting the Channel and North Sea.

For almost two years after the fall of France these trains were practically unmolested.

Then, unwittingly, slackness by the Luftwaffe wrote the doom of these trains by the hundreds.

Throughout the 1941 winter R. A. F. night fighters went on "intruder" patrol over the German aerodromes in the near-Continent. Many a German bomber, taking off or landing, was smothered by bursts of machine gun or cannon fire. Some were smashed by bombs dropped directly in their paths, though most of the intruders prefer to shoot rather than to bomb.

When spring came, the Luftwaffe sent up fewer and fewer night bombers.

More and more intruder teams—usually pilot, navigator-plus-bomb-aimer (bombardier), and rear-gunner-plus-wireless-operator—hung around the enemy aerodromes for long, boring hours, then went home without firing a shot.

So a few aggressive, rebellious souls, on completing their dull shifts, went looking for trains.

They found that if they fired a long, steady machine-gun burst at locomotive boilers the train would stop, the steam would pour from the punctured high-pressure tubes, and, sometimes, more gratifying still, the locomotives would actually explode.

When more intruders were fitted with cannon the results were sometimes obtained with a single sharp burst.

So the once-bored intruders spread the gospel.

Reports and photographs proved the damage and chaos on the overstrained rail system already suffering from lack of skilled maintenance engineers.

Train-busting became a recognized sideline. Indeed now, at times, special expeditions go out, although German aerodromes and planes are still the first objective.

The frantic Germans fitted armour plating over the boilers. But these did not stop the shells.

The Germans put anti-aircraft machine-guns in the tenders. These were easily overcome.

Mostly the train-busters fly so low that heavy A. A. guns cannot be depressed sufficiently in time to be of use. One buster followed a train so closely that he carried away a signal arm. Another, Sergt.-Pilot "Scruffy," blew up an ammunition wagon from such short range that his Boston was thrown almost upside down and came home holed like a colander.

On bright nights the intruders fly along the lines, looking at the continuous shining metals. If the lines are broken by a dark patch they look for a train. On cold nights they see the steam and smoke.

On dark nights they look for the tell-tale glow of the firebox or chimney.

The intruders are heartened by the knowledge that the French civilians are forbidden to travel at night. The railwaymen who operate the trains carrying war material to kill our troops and those of our Allies must take their chance, as must the engineers pouring out munitions for Germany in the French factories.

ONE of the pioneer train-busters, foremost in urging the practice as a sideline from aerodrome strafing, is a squadron leader.

The extensive successes and brilliant teamwork of his Boston crew played an important part in the development of train-busting, which has cost the Germans:

Locomotives worth more than $5,000,000;

Destruction of serious damage by fire, explosion, or train-wrecking to hundreds of thousands of tons of war material;

Delay of some kind to millions of tons of material.

Here an attempt is made to re-construct an astonishing night flight made by the squadron leader and his team as seen from the pilot's cockpit:

The machine is a Boston.

In front, and below, unseen in the nose, is the bomb-aimer. Behind, unseen, the rear-gunner.

So here we go. We are in the pilot's seat of the Boston, and have completed our duty patrols over aerodromes south of Paris. The moon is not far from full. There is a keen wind, the sky is absolutely clear, visibility is marvelous.

What happens tonight is a typical patrol, with much unmentionable back-chat between members of the crew.

We are flying down the Seine, with Paris behind us.

Let's get right down. Ease back level at 50 feet. Any coal barges to sink?

Whew, look at that flak crossing the river! It's hitting the houses on the other side. Let's go a bit lower.

Now the guns on the other bank have opened. We can get underneath the cross-fire.

Just look at that gasometer (gas tank). It must be two miles away! We'll get a bit closer, then turn in.

Four hundred yards away, 300. Wheel over hard right. Now she's in sight.

Squeeze the button. Watch our fire smack into her! Hard left or we'll hit her. Look, she's burning! Let us climb a bit and look back. See, she's glowing red hot inside. Wonderful sight.

Now we turn to the Rouen railway line. Up to 600 feet. No higher, because then the heavies might make it awkward.

Lovely night. What's that? A goods train! Must be four miles away. Ah, there she is. We'll get behind her.

Column forward a little. Now the train slides into view. Steady. Keep dead in line. Not too fast. I shan't open fire till we are half-way along, about 30 trucks from the engine.

Now, squeeze the button. Watch our fire sew up the train, setting the trucks ablaze. Check at the locomotive. Hold her. Now away, in a climbing turn. She's stopped. Steam is spreading over the fields. We'll turn back and have another crack.

What's that? Another train ahead? So there is. Down on her. Steady. Sew up the trucks. Hold on the locomotive. Ah! She's stopped.

Turn again, Whittington, and back again over them both. Look, there are some trucks not burning. Give them another squirt. Up they go.

Well let's get on to the Rouen-Havre stretch. Down a bit to dodge the heavy stuff.

We must be running a bit short of ammo. Look, another train. Hold tight. Down we go. Another squeeze. She's burning. See those flashes!

Up we go, over the engine. Turn at 500 feet for another crack, head on.

Press the button. Damn!

A short burst and she runs dry. Why don't we carry more ammo? Might as well go home now, chaps. ☆

ANSWERS

To Quiz on Page 33

1. d. Distinguished Service Cross
2. b. Major General James H. Doolittle
3. d. Air Transport Command
4. b. P-51
5. c. Zero with American insignia
6. a. Focke-Wulf 190
7. c. Traffic signal
8. c. B-26
9. b. Drift meter
10. b. Link trainer
11. b. 50-calibre
12. b. Magnetos

A JUMP AHEAD OF THE JERRY

(Continued from Page 7)

field guns to the rear. We were still using Hurricanes when I was transferred to the Second Eagle Squadron in May, but we switched to the Spitfire 5s early in June.

The Spits had everything the Hurricane didn't have, including heavier firepower with their two cannon and four machine guns. They were lighter on the controls and much touchier, but I'll still take the Hurricanes for maneuverability.

Soon after we got our Spits we started escorting the bombers across. The Germans reached the point where they wouldn't mix it up much with just fighters on a sweep—they waited for bigger game. We would go over escorting Blenheims, Hampdens and Bostons at one time or another, and the Jerries would come out.

AND YOU have to give those boys credit for a lot of guts, too. Here's what would happen on a typical bombing raid:

About six squadrons of us would be flying an umbrella over the bombers in layers, one squadron above the other. The enemy would be above us. All of a sudden, someone would yell over the intercom:

"Here comes one!"

Down would come a Jerry, through one layer of Spits after another, with all of us who were in position taking a squirt at him, until he could take a swipe at the bomber formation—if he got that far—and home he'd go. Others would follow his maneuver.

Occasionally, one would come up into us from below, roll over on his back to look us over, open up with a burst and roll into a dive.

If it's worked right you can give those bombers plenty of protection. In the dozens of bomber-escort sweeps I took part in during 1941 we lost only four bombers. Other squadrons had similar records.

In August of 1941 I was shifted to the First Eagle Squadron which was engaged in close escort work. The First Eagles were still using Spitfire 5s.

The R.A.F. fighter and bomber commands were exceptionally well coordinated. Our right hands and arms used to get tired as hell on those close escort sweeps. Sometimes we'd take the stick with our left hands and, frequently, both hands to give the right one a rest. Now and then, one of us would drop down and come in under a bomber formation, ease up close and rest for a half a minute or so. Those bomber fellows knew us like brothers.

I got my first Jerry on September 21, 1941. Like a lot of others I might have shot down one or two before, but this was the first one I could really count. You see, the R.A.F. won't let you chalk up a score unless you see the enemy plane crash, the pilot bail out or the plane break to pieces in the air. If you see one going down with an unusual amount of smoke trailing him, they'll let you count him as a probable.

Under this scoring system all of us probably got more than we actually counted. Most of the time we were flying so high we couldn't see them crash. Or else we were too damned busy to wait around and see what happened.

But, at any rate, I got my first one for sure that day we escorted six Hampdens to Lille. Incidentally, the Lille missions were the longest on which fighters served as escort.

It was a running fight all the way in and out. Mine happened to be one of the two escort planes to make the widest turn over the target, and just as we had completed the turn an ME-109E dived down on us. The C.O.—he was in the other fighter—figured the ME was too far out of range and kept on course, but I decided to go down after it.

I got a good squirt at the Jerry at about 5,000 feet and then finished him off at 3,000. He smacked the "deck" and broke into pieces but I managed to level off just over the tree tops.

All the Hampdens were hit by flak but none by German fighters. When I regained altitude to join the boys I weaved into a position on the tail of another squadron. That was the customary thing to do, for by the time we got straightened out under such circumstances, our own outfit would be pretty well up ahead.

ON THIS occasion I was just settling down when I saw what I thought was a fellow Spit weaving in to join the tail of another outfit across the way.

I remember saying to myself, "There's a guy who feels as good as I do." Just about that time, this other guy rolled over and shot the Spit about 50 or 75 yards in front of him all to hell. Pieces flew all over the place. The Jerry rolled into a dive and headed for home. You've got to be on the watch for that sort of thing.

During the month of October, the First Eagle Squadron had the top score for the R.A.F. I was pretty lucky. I managed to get five that month.

One of our best shows came early, on October 2. We jumped 24 Messerschmitts when we crossed on a mission that day. Four of us got there ahead of the rest of the squadron. The C.O. and I opened up on the first one and knocked him down. A little later I got two more. In all, we chalked up five out of the 24 without a loss.

On October 16 I got another one during a low-level "rhubarb" across the Channel. "Rhubarb" is the name the British use to describe a sort of private show the boys go on occasionally. We went on these little parties in pairs most of the time. That same day I blew up a train. When the locomotive exploded I was about 50 feet over it, and the blast boosted me up about 300 feet. Boxcars and "goods wagons" were ripped up all over the place.

It was on a similar junket eleven days later that I knocked down a couple of MEs. While flying alone I suddenly spotted six German fighters in formation. I came in from underneath and behind, and knocked off two before they knew I was there. Then I ducked out of the way before the others could do me any damage.

Fortune smiled on me that day. I managed to blow up my second train and mess up a gun post before heading for home. (Major McColpin was awarded the British Distinguished Flying Cross on November 8—Ed.)

I joined the Third Eagle Squadron, which had just been activated, late in January of 1942.

Early in February a sergeant pilot and I were convoying over the Channel when a bunch of Dornier 217s moved in with heavy cloud cover. I damaged a couple of them when they came out of the clouds for an attack. The sergeant who was new at the game, was running all over the sky like a chicken with its head off. Most of us react that way the first few times we get in hot combat.

One kite broke through and I shot out the tail gunner. I got the front gunner on another one just as my ammunition ran out. Later I made two attacks with empty guns, but the Jerries didn't know the difference and got the hell out of there.

We started making sweeps again in April, and on April 26 I got my first Focke-Wulf 190 in a scrap just off Boulogne. We didn't mind the Focke-Wulfs so much. They are more maneuverable than the Messerschmitts but the Spits have got it all over them.

I knocked out this one by pulling a little trick I had been studying for a long time. We had been waiting for the Jerries to dive in on us; then, just at the right moment, we would bank off to let them go by and continue the turn to get a crack at one as he passed. We didn't get touched following this procedure but we didn't get many cracks at the enemy either.

ON THIS occasion three Focke-Wulfs were diving on us, one after the other. We made the usual banking turn, to the left this time, but instead of continuing the turn I rolled over to the right and came back down, figuring I'd just about get the No. 3 Jerry in my sights. For a split second I thought I had miscalculated and he had gone by. But suddenly he zoomed in front of me and I let him have it.

The Third was the only Eagle Squadron that had any real night fighting. In all, I put in about 50 or 60 hours at night. Our best night fight came on April 29, after forty German bombers began blitzing York at two o'clock in the morning.

We were sleeping in quarters about three miles from our planes which were based about 60 miles from York. Within ten minutes after receiving a telephone call to turn out, we had dressed, reached our planes and taken off.

First to get in the air, I went through the entire take off more or less automatically.

I hadn't waked up sufficiently to know what was going on so I circled the field a couple of times with my lights on and the others followed. I remember shaking my head and asking myself aloud: "How the hell did I get up here?"

About that time we spotted the flames shooting high in the air from burning York. As we neared the town, I made the mistake of figuring a way I thought I could get in some extra licks.

After making an orbit around the town I dived into the middle, thinking I could knock off a few enemy bombers by spotting the source of their tracers as they came in to strafe the streets and houses. I didn't do too well. The other fellows stayed up a bit and got in some better licks. Some show. You could see the shells explode on the enemy kites and, now and then, one of their motors would catch fire.

Final score: three bombers destroyed (they found the wrecks after daylight), one probable (this one limped off toward the North Sea with one engine afire), and two damaged. One of us had to bail out.

We ran into a flock of ME-109F's during a sweep on May 17, two weeks before I was scheduled to leave for the States on a couple of months' leave.

Before we took off on the sweep, some of the boys had been kidding me.

"You're surely going to kick yourself in the pants sitting in some concentration camp."

As it turned out, they were damned close to being right.

During the scrap I knocked down one for sure and shot the tail off another one but nobody saw him hit as we were flying at about 22,000. He was scored as a probable.

I was in no position to hang around for the result because a couple of Messerschmitts were on my tail and giving me hell. I went into a dive at 20,000 and picked up to about 620 miles an hour all the way down, full throttle.

When I finally leveled off I was about 20 feet over the water, and that's the way I came home. The Jerries chased me nearly all the way in.

I kept saying over and over to myself, "If you bastards think you're going to stop me from going back home, you're crazy."

I headed for the nearest airdrome on the coast and when I set my Spit down I had two gallons of fuel left. Another heavy turn in that dogfight and my leave would have been cancelled—maybe for good.

When I checked out for the States later in the month, I happened to be leading the Eagles with eight enemy planes down for sure. But more than that, I was two up on Gussie Daymond (Major G. A. Daymond, now with the Army Air Forces—Ed.) Daymond and I were engaged in what you might call a little private competition.

It started back when I went with the First Eagle Squadron—his outfit. When I checked in he already had four. I had none. From August to January, however, I knocked off six while he was getting one. That put me in the lead six to five.

Shortly after I joined the Third Eagles, he got another one to tie the score. Daymond then went on leave and, while he was away, I got a couple which put me in the lead again. But during my ensuing two months' absence he knocked down two more to lock the score at eight apiece. And that's the way it stands.

Shortly after returning to England in July of last year, I was given command of the Third Eagles and we started escorting American B-17s across the Channel. During the next few weeks we completed missions to such important target centers as Abbeville, Rotterdam, Rouen, Maux and Caen. The Germans had let up considerably in this area, which was probably a good thing for them for, in addition to the exceptional firepower of the Fortresses, my squadron was pouring it on for the first time with Spitfire 9s.

On September 15 we were transferred from the R.A.F. to the Army Air Forces. We continued to use Spit 9s and from then until the last of November, when some of us were ordered back to the States for interviews, most of our missions were with B-17s.

During my operational time, I learned quite a few lessons. But perhaps the one thing that stands out most in my mind is this:

The Jerry is good. Don't sell him short. But, when the sides are anywhere near even, you should never get shot down—or even hit—as long as you can see, and recognize his plane. The boys who get it are those who are caught unawares or are not up on their aircraft recognition. ☆

Lines to the 180° Turn

"Oh, I don't care," said Pilot Dumstare,
"How the barometer's lookin'.
I'm hotter than hell and I can tell
When any weather is cookin'.

"These forecast blokes are a bunch of jokes
With their isobars and highs.
They'll hold you bound to the solid ground
If they see a cloud in the skies.

"Form 23 is not for me—
I've got natural savvy for weather.
Just give me a ship and let me skip—
I'll bring her in like a feather.

"Just let it pour and let it roar,
Let it buck like the waves of the sea.
Why listen, brother, that's just another
Breeze for a pilot like me.

"I'll take a chance on the seat of my pants—
To hell with a right-about run.
I'll never learn a half circle turn.
It's dangerous? . . . Sure, but it's fun."

So up and away on a doubtful day
Went weather-wise Pilot Dumstare.
He headed for fun as he gave her the gun
And zoomed off into the air.

He didn't see on his Form 23
That a cold front was headed his way—
Nor did he care— not Pilot Dumstare.
(You recall what he had to say.)

So into the soup he dove with a whoop,
"This is my meat, watch me"—
And watch they did, for that dimwit kid
Who hadn't read Form 23.

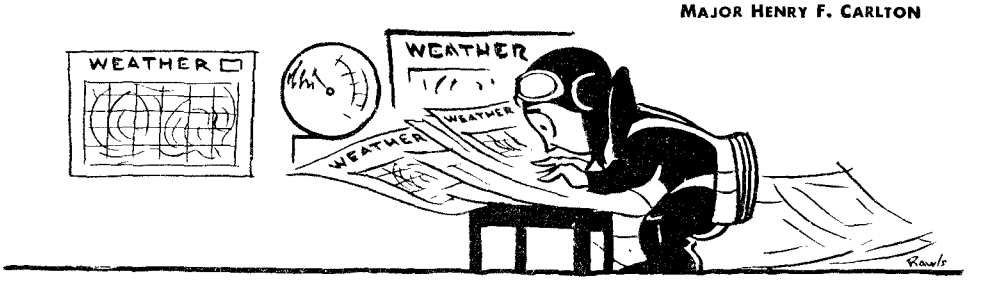
They watched that night with growing fright—
He was eighteen hours overdue.
The wreck of his plane they found in the rain,
But Dumstare was nowhere in view.

It rained, it poured, the cold wind roared,
Three days of fury unbent!
Dumstare crawled in, wetter than sin,
Cold and ragged and spent.

Now Pilot Dumstare has an added care—
When he clears for a hop—even short!
You can watch him pore for an hour or more
Over every Weather Report.

If he can spy a cloud in the sky,
Or the trace of a coming breeze,
Then you'll discern that beautiful turn
Of a hundred and eighty degrees.

MAJOR HENRY F. CARLTON



ROLL OF HONOR

(Continued from Page 30)

M. Taylor, Francis R. Thompson, Richard K. Werner. **MASTER SERGEANT** David Semple (Also Oak Leaf Cluster to Purple Heart). **STAFF SERGEANTS:** James G. Brown, Lawton Buchanan, O. C. Cook, Leroy H. Penworden, Alvin Simonds, Claude F. Wiseman. **TECHNICAL SERGEANTS:** Frank Benedict, Verne T. Debes, Luther B. Word. **SERGEANTS:** Edwin L. Albrecht, Russell Fritz, Howard T. Harper, Francis E. Hurn, Wade L. Nelms, Olus E. Price, Warren V. Sherwood, Lloyd D. Whipp, Joseph O. Wingard. **CORPORALS:** Eugene R. Bennick, Francis M. Fowler, John T. McClarnon, Claude W. Winkler. **PRIVATES FIRST CLASS:** Loid W. Andersen, Charles O. Backstrom, Charles W. Bartlett, Levi W. Blakney, Herman Boyd, Harry S. Brissenden, Charles S. Brooks, Jr., Douglas L. Brown, N. D. Bunardzya*, Bert F. Byrd, Jr., Carmel R. Calderon, Franklin B. Cardwell, Dennis Cawley, Eugene L. Chambers, Leo R. Coale, Paul E. Comstock, T. V. Corbett, Robert P. Damsky, G. T. Davis, George Deraney, Grady E. Exum, Charles H. Freeman, Kenneth W. Gremore, Rogers W. Hall, Walter A. Hammond, Lester W. Holley, George L. Jones, Phillip J. Kane, Chester A. Lamb, John N. Leggitt, Deith E. Libby, Edward Lisiewski, William H. Manley*, James E. Martin, Louis W. Menge, C. C. Morrison, C. E. Narehood, Harry Newman, M. L. O'Brien, Marvin Olsen, Joseph J. Panek, Donald D. Plant*, Charles P. Porterfield, John L. Preston, I. H. Pulley, Jr., Eugene R. Ray, George L. Richardson, Joseph H. Riotte, G. R. Rosenberry, R. L. Schott*, H. L. Sembroski, R. R. Shattuck*, Maurice E. Stevens. **PRIVATES:** Kenneth E. Adams, Edward L. Allen, Robert G. Allen*, James S. Altamare, Herbert Aubrey, Clinton D. Baer, Robert E. Baird, Walter A. Barasha, Leonard M. Barnes, Jr., James Bibb, Robert W. Bloxham, Seymour Blutt, Joel J. Boersema, Jack L. Bois, Paul T. Bowsher, Jr., Alfred W. Broughton, Robert L. Brown, Francis R. Bush, Roy W. Byers, Robert T. Byrd, Francis E. Campiglia, L. D. Carey, Dean W. Cebert*, Joseph A. Christopher, Charles S. Clague, Walter L. Collins, Fred R. Conner, John Couhig, Charles W. Craig, Lincoln M. Crum, Charles R. Dagon, Frank R. Dallas, Allen D. Davis, Robert E. Dietterick, Oscar H. Douglas, William T. Duvall, Cecil W. Dye, Jerome A. Even, Benjamin P. Faunce, R. G. Fitzsimons, Robert E. Fleming, George J. Gabik, Bill P. Gautier, George W. Goff, Allen E. W. Goudy*, Robert D. Hamrick, Roy Hendricksen, Charles W. Hill, Jr., John P. Holloway, William H. Hudson, Earl F. Hughes, Robert L. Hull*, James L. Johnson, Thomas R. Johnson, James F. Jones, Louis Jorda, Jr., Bert J. Jordan, Don R. Joyce, Walter L. Kaminski, V. J. Kechner, Wallace A. Kempen, Phelps W. Kight, Thomas P. Kimble, James S. Kossak, Walter Lapic, Harold Lenburg, Ivan C. Lewis, John S. Lopinsky, Warren Lyon, R. W. McClellan, Cecil H. McDonald, B. P. McLeod, J. H. McRoberts, William W. Mauhar, Paul Mitchell, Kenneth L. Mougin, Vernon A. Nelson, Edward M. Oveeka, Ralph G. Paschall, Louis Penven, Donald H. Peterson, Raymond Raines, William L. Reininger, B. A. Reynolds, Edwin Roberts, H. J. Roseman, M. D. Sackett, L. J. Scalzo, E. L. Schmitz, Frank A. Staab, Arthur W. Werner, Elmon S. Yargus.

DISTINGUISHED FLYING CROSS

COLONELS: John R. Hawkins, Paul L. Williams. **LIEUTENANT COLONELS:** Alvin Edward Herbert, Charles H. Kruse, Elliott Roosevelt. **MAJOR** John E. Dougherty. **CAPTAINS:** John L. Brownewell, William J. Cummings, P. W. McIntyre, John P. Randolph, Robert M. Ritchie, Charles R. Sneed, Henry G. Thorne, Robert C. Williams. **SECOND LIEUTENANTS:** Louis B. Briglia, Emmette W. Ford, Perry L. Franks, Raymond M. Gehrig, Warren George, Jr. **PRIVATE FIRST CLASS** John A. Aresl.

SOLDIER'S MEDAL

MAJOR John R. McBride. **STAFF SERGEANTS:** Murnice E. James, Milton F. Kelm. **TECHNICAL SERGEANTS:** Robert M. Aardema, Albertis P. Hildred. **SERGEANTS:** Albert C. Corbello, Eugene W. Cull, A. H. Paddison. **CORPORAL** Clarence E. Bauer. **PRIVATES FIRST CLASS:** Stanley J. Bogdan, Alfred O. Bonin, Walter D. Boulier, James E. Carrow, Edward H. Cavanagh, Solomon Crystal, Myron R. Grant, Abney C. Hines, James A. Huff, Romuald Kaster, Everett D. Keim, G. E. O'Connell. **PRIVATES:** Thomas P. Deutsch, Dominic J. Dibiasi, Hoyte W. Galloway, Michael G. Heick, W. I. Martin, Jr., W. R. Nixon, Jr., E. R. Savage, Edward A. Singer, Tony Tintori, Harry L. White.

AIR MEDAL

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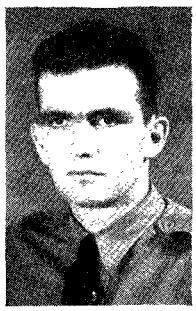
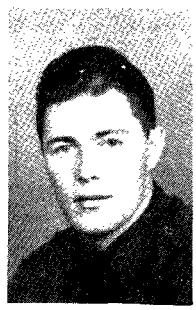
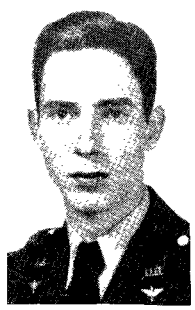
Col. John M. Stone



Lieut. Bruce B. Barker



Lieut. Leland A. Walker, Jr.



Captain Jack Adams

Captain Melville Offers

OAK LEAF CLUSTERS

CAPTAINS: Harold N. Chaffin, Richard T. Kight, George E. Schaetzel. **LIEUTENANTS:** Donald C. Miller, William M. Railing*, Merle C. Woods. **MASTER SERGEANT** Durward W. Fesmire. **STAFF SERGEANTS:** Max Baca, William E. Bostwick, Derwin D. Terry. **TECHNICAL SERGEANTS:** Francis G. Denery, John M. Geckler (Two Oak Leaf Clusters to Silver Star). **SERGEANTS:** Ignatius E. Barran, Edward J. Czekanski, Orville W. Kiger (Two Oak Leaf Clusters to Silver Star), Victor Lorber (Two Oak Leaf Clusters to Silver Star), Arthur W. Norgaard, William Sage, C. W. Thrasher, Richard A. Williams. **CORPORAL** Robert A. French*. **PRIVATE FIRST CLASS** John Makela. (*Posthumous.)

PICTURE CREDITS

8: Appleton Studio. 15: National Advisory Committee for Aeronautics. 22-23: "The World in Maps," by W. W. Jervis. 28: Fairchild Aircraft. 33: Rudy Arnold; Life. All other photographs secured through official Army Air Forces sources.

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ORGANIZATION OF THE ARMY AIR FORCES

(Continued from Page 13)

the necessary administrative tools. This is the function of Management Control, which includes within it the divisions of the Air Adjutant General, Statistical Control, Organizational Planning and Legislative Planning.

4. All military organizations require special staff sections. The duties of the Budget and Fiscal Officer, the Air Judge Advocate and the Air Inspector are not unlike those of similar officers in all traditional military organizations. The Special Staff Section also includes the office of the Air Surgeon, under whose supervision comes the effects of high altitude flying and other aspects of the physiology of flight.

5. An air force in operation divides itself readily into four basic parts—Air Defense, including fighters, anti-aircraft artillery, and an aircraft warning service; long range Bombardment, including heavy and medium bombers; Air Support of ground forces, including dive bombers and light bombers as well as fighters used for strafing ground troops, and Base Services, composed of facilities and supplies which are necessary to get combat aircraft into action. To insure that these four essential military requirements are properly met, a director of each type was created with the duty of supervising and directing, in the name of the Commanding General, the development of their particular specialty in the Army Air Forces.

These so-called "Type Directors" are on the Operational Staff level. They supervise and direct the execution of the policies determined by the Air Staff. Their activities are coordinated by the Director of Military Requirements. Since the training of individuals is a large part of the job and the movement of units and their organization into task forces is also an essential preliminary to combat, Directorates of Individual Training and of War Organization and Movement also were added under the Director of Military Requirements.

6. There are certain specialties in which an air force has a vital interest, so vital an interest that it is desirable to have a staff section charged with supervision of the development to high proficiency of the technical service involved. To meet this need Directorates of Photography, Communications and Weather have been created. Their activities are coordinated by the Director of Technical Services who is on the Operational Staff level.

7. It was apparent in building an air force of over two million men that innumerable personnel questions of an operating nature would arise, and it was desired to free the A-1 Section of the Staff from the interminable detail of current personnel matters in order that it might devote itself to personnel planning in the broad sense. So, a Director of Personnel was created to be responsible for the detailed procurement, classification, assignment, promotion and discharge of both military and civilian personnel.

8. Training flying personnel as rapidly as possible for combat raises serious problems in connection with the prevention of accidents. Safe flying calls for coordinated direction of air traffic. Accordingly, a Directorate of Air Traffic and Safety has been created on the Operational Staff level. Reporting to it are the Directors of Flight Control, Flying Safety and Safety Education. The purpose of the Directorate is to supervise the Army Air Forces flight control system, establish programs to prevent aircraft accidents and provide for safety education of Army Air Forces personnel.

The various sections and divisions described above constitute Headquarters, Army Air Forces. They are in a certain sense an integral part of the brain of the Commanding General. When they speak, they speak in his name and by his authority. They make it possible for him to be advised on all of the vital functions which must be performed if the mission of the Army Air Forces is to be accomplished.

So far, this article has dealt largely with policies and operational planning. The plans, programs and policies approved by the Commanding General upon recommendation of his Staff are carried into effect by the various Army Air Forces Commanders and the Air Forces. Performance of the mission of the Army Air Forces can be likened to a series of funnels, all leading to a main pipe.

Into one funnel—the Technical Training Command—go individuals who are to furnish the technical and administrative personnel for the Army Air Forces, such as radio operators, mechanics, personnel officers, supply officers, weather, photographic and communications personnel and the like.

Into another funnel—the Flying Training Command—go the flying personnel, including pilots, observers, bombardiers, navigators and aerial gunners.

Into a third funnel—the Materiel Command—go plans and specifications for the aircraft and technical equipment which the Air Forces will use. Contracts are drawn, production schedules prepared, inspections performed and modifications made.

The completed aircraft and equipment flows into a pipe marked Proving Ground Command. Here it is tested in flight.

The resulting product then splits into two pipes. Aircraft are flown to their destination by the Air Transport Command. Equipment is stored in depots by the Air Service Command and delivered on requisition to the using units. Both equipment and aircraft when in need of repairs or maintenance flow back upstream to the Air Service Command.

The pipe whose funnel is the Materiel Command meets the pipe whose funnels are the Technical Training and Flying Training Commands at the schools with respect to training aircraft and equipment and at the Air Forces with respect to combat aircraft and equipment.

The Air Forces in the continental United States have dual functions. On the eastern, southern and western coasts they are part of the defense commands charged with defending the country against attack, but they also provide the operational training which is a necessary prelude to combat. Units are formed from graduates of the schools and work together until they are ready for overseas duties. As occasion requires, units are detached from these Air Forces and sent to the air task forces which are fighting the war. This is one step in the formation of Air Forces overseas.

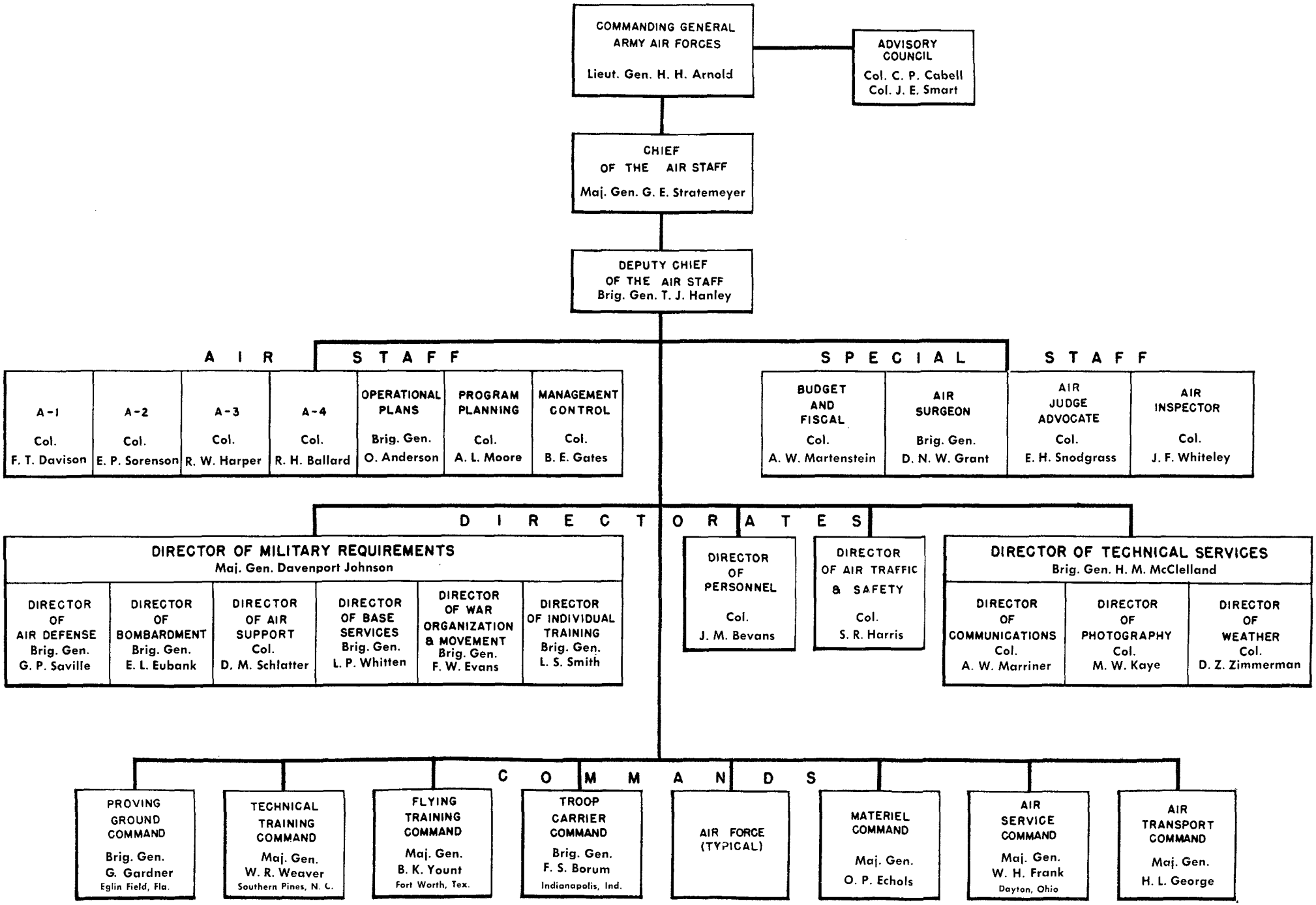
To train the personnel required for such aspects of modern war as the transportation of airborne infantry, parachute troops and glider-borne troops, the Troop Carrier Command was organized. It does the operational training for this type of unit.

To run the airlines which circle the globe, carrying personnel and equipment to theaters of operation, the Ferrying Command was organized in 1941. Shortly after the reorganization of March 2, its name was changed to Air Transport Command. It also delivers aircraft from factory to field, whether that field be located in Chattanooga or Chungking. It is engaged in operating the most extensive transportation system in the history of the world.

The picture would not be complete without mention of the units of other arms and services on duty with the Army Air Forces. An air task force could not function successfully without units and individual personnel drawn from the Corps of Engineers, the Ordnance Department, the Quartermaster Corps, the Signal Corps, the Chemical Warfare Service and the Military Police. Chaplains perform an essential function with all Army units. More recently the WAACs have arrived to add their important bit to the total picture. Service personnel of this character is procured for the Army Air Forces by the Services of Supply and is welded into the Army Air Forces organization during the operational training period. Relations between these other arms and services and the Army Air Forces are coordinated at Headquarters by the Directors of Base Services, Communications and Personnel.

These, then, are the agencies through which the Commanding General, Army Air Forces, performs his mission of procuring and maintaining equipment and providing Air Forces units trained for combat. It is obviously impossible in so brief an article to do more than paint the broad picture of organization. In a very real sense this organization has grown from the necessity of modern war. Since those necessities are constantly changing, it is not unreasonable to suppose the organization will also undergo revision from time to time. ☆

ORGANIZATION OF THE ARMY AIR FORCES



HALT!
HIS DUTY—TO SEE YOUR PASS.
YOUR DUTY—TO SHOW IT!

AIR FORCE

OFFICIAL SERVICE JOURNAL OF THE U. S. ARMY AIR FORCES

MARCH 1943

Vol. 26 No. 3

MARCH 1943

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AIR FORCE is primarily a medium for the exchange of ideas and information among Army Air Forces personnel. Opinions expressed by individual contributors do not necessarily express the official attitude of the Air Forces or the War Department.

AIR FORCE

OFFICIAL SERVICE JOURNAL OF THE U. S. ARMY AIR FORCES

March Brief

HELICOPTER is not a coined word or a trade name. It is as much a part of aviation terminology as, let's say, monoplane or glider. And there are those who insist that the word helicopter will be a household favorite in the years to come.

Be that as it may, we support this month's cover picture with two articles and additional pictures of the Army Sikorsky Helicopter — described as "the Army's first practical and successful helicopter aircraft." The cover picture shows that craft standing still in mid-air to take on a passenger without landing.

Colonel H. F. Gregory of Wright Field will introduce you (on Page 6) to the Army Sikorsky Helicopter. Colonel Gregory, who acted as project officer for the development and procurement of this "flying windmill," reports on the results of more than ten months of testing the ship and takes you through the motions of flying it.

This wingless aircraft was delivered from the factory to Wright Field last May in what was a helicopter's first cross country flight in the Western Hemisphere. Not long after its completion C. L. Morris, the pilot, recorded the trip while its details were still fresh in his memory. Now, after ten months, his story can be told. The mile-by-mile narrative by Mr. Morris, full of sidelights and humor, starts on Page 7.

YOU MAY be surprised to hear that in place of radio equipment another seat has been wedged into the cockpit of the P-38, making it possible for this single-seater to serve as a transition trainer. The story of the conversion is told on Page 10 by Lieutenant John Truesdell of the Directorate of Flying Safety.

IF YOU'RE INTERESTED in a combat report on what it means to stay a jump ahead of the enemy we refer you to the article on Page 4. We've called it "What You See Won't Hurt You," and offer it as practical comment on the important aircraft recognition problem. The author is Lieutenant Charles W. Tribken, Jr., a 24-year-old fighter pilot who recently completed 200 operational hours with the Royal Air Force, first with an Eagle Squadron in Britain, then with an RAF unit in Africa. He flew late model P-40Es through the last big desert push against Rommel's forces. After a year and a half with the RAF, Lieutenant Tribken has just been transferred to the Army Air Forces. This is his first attempt at writing for publication and we don't mind saying we would be happy to use more of the same caliber. That's an open invitation.

MOST OLD TIMERS have at one time or other toyed with the idea of a navigation system to end all navigation systems. The instrument labs at Wright Field are flooded with navigation inventions of all types, and welcomes more. The job, explains Colonel Thomas L. Thurlow, of Wright Field, "is to spot the phony systems and to encourage development of the ones that can be depended on to bring our planes home." Colonel Thurlow's article should help you recognize the phony and the good. It begins on Page 8.

MAJOR JOHN C. HENRY of the Air Transport Command, former Washington newspaperman and president of the White House Correspondent's Association, was stationed at the ATC base in West Africa where Brigadier General Patrick Hurley stopped overnight enroute to Russia on a special mission for President Roosevelt. At General Hurley's request, Major Henry joined the party—the first group of foreign observers permitted to view action on the Russian front. An account of their observations was written by Major Henry for AIR FORCE. It appears on Page 17.

FLIGHT CONTROL at first glance looks like a pretty ornery looking beast, writes Lieutenant Colonel George C. Price, Director of Flight Control for the Air Forces, but isn't such a bad critter once you get used to it. Colonel Price explains what he means in an article on Page 12.

THE SOLOMON ISLANDS haven't been an ideal spot for a lengthy canoe trip, but Lieutenant Wallace S. Dinn, Jr., a Southwest Pacific P-39 pilot, managed it all right. After bailing out of his crippled ship over the Solomons, Lieutenant Dinn, with some friendly natives, paddled to safety eight days later. Oh, yes, there was another passenger a Jap pilot whom they captured enroute. Lieutenant Dinn tells about the experience on Page 23.

CARDBOARD SPLINTS? Yes, they form the basis for a novel combat first aid method originated by Major Walter J. Crawford, March Field, California, and outlined on Page 20 in an article by Sergeant Max Baird. Major Crawford is a flight surgeon on leave from the medical faculty of Tulane University. Sergeant Baird is a former Kansas City newspaperman and magazine writer.

FORMERLY THE AIR FORCES NEWS LETTER

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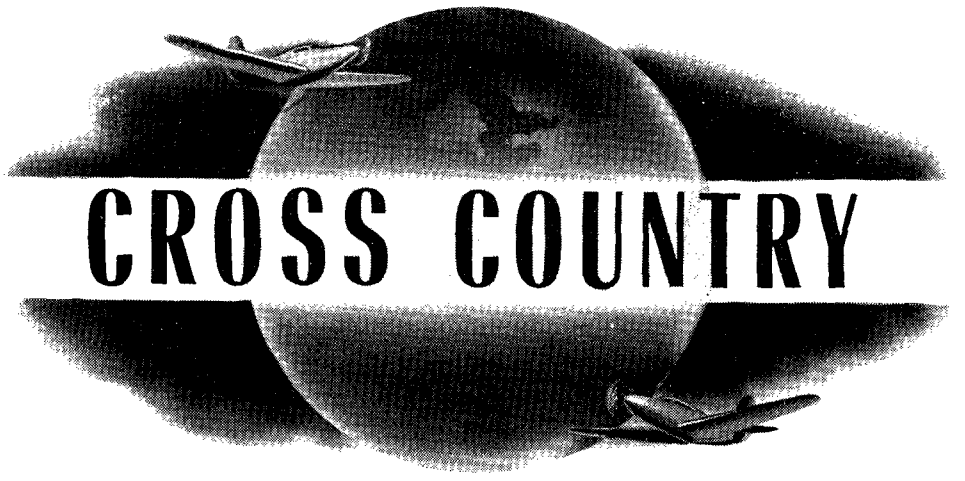


What Army Emergency Relief means to you; developments of the month within the Army Air Forces.

"IT'S NOT just being away from home," a sergeant explained the other day. "A guy expects that in the Army. It's wondering whether the family is making out all right, and if they'll be taken care of if an emergency comes up."

For some time now we've been hearing about Army Emergency Relief. Radio programs, football games and stage shows, we've been told, are giving all or part of their take to the fund. Dollars, millions of them, have been pouring in. What happens to all that dough?

A man came to his local AER office and explained he had four sons in the Army. They had supported the family. Until their allotments arrived, he needed money to pay taxes, mortgages and interest on the home. Through AER a loan was granted, the house saved. The money was repaid when the allotment check arrived.

A wife with an Army husband in Australia had saved carefully for her baby, but gave birth to a son two months prematurely. It meant a lot of extra money for incubators, nurses, etc. The AER came quickly to the mother's aid, gave her a check for what she needed.

A young lieutenant with a wife and two children, who lived up to the limit of his salary, was suddenly ordered on a mission. The expenses would be at least a hundred bucks, and he didn't have it. The AER supplied him with the cash, and when he returned and collected his per diem, he repaid the loan.

A worried mother, with an eight-year-old daughter and an Army husband a long way from home, came to the AER for help. Dentist bills for the girl had piled up; gas and electric light bills had to be paid. She was getting behind and saw no way of catching up. The AER took all her bills, paid them and put some cash in her pocketbook to help her get a fresh start.

A private, called home when his wife gave birth to a child, had saved up $200 for the event, estimated as enough to cover expenses. But there was trouble—a Caesarean, blood transfusions, plenty of complications. The $200 didn't half cover the expense. The AER stepped in, gave the private the money needed for all the unexpected extras. He went back to camp a much happier guy, knowing AER was behind him. That's not speculation, either, for he wrote AER a letter of thanks and told them so.

Hundreds of similar cases could be cited. For Army Emergency Relief means just what it says—relief for military personnel and their dependents in an emergency—and it was set up at the instance of the Secretary of War for that purpose. Here's how it works:

If an Army man or his dependent needs money he can go to his nearest AER station and present his case. He fills out applications — this is still the Army and there's sure to be paper work — and the case is investigated. If relief is granted, the applicant is given a loan, cash grant or relief in kind (food, clothing, etc.), depending on the nature of the case.

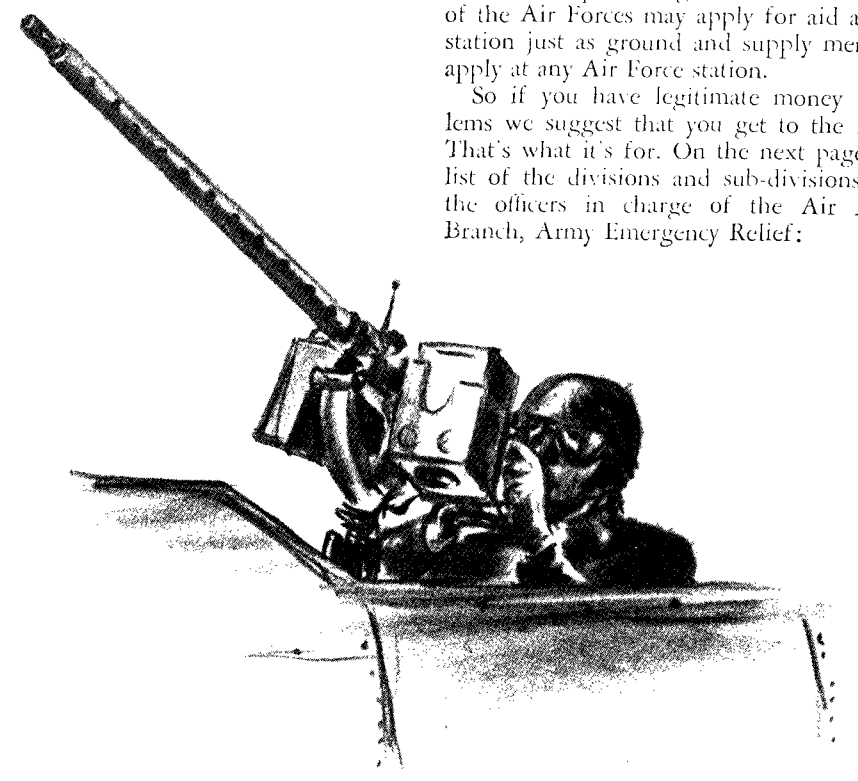
The AER works hand in glove with the American Red Cross; in fact, it was a grant of a million and a half dollars from the Red Cross that started the ball rolling. And now it is the Red Cross, through its field representatives, that investigates cases coming to the attention of the AER.

No funds are solicited by this outfit. It takes money donated through benefits and the like, but no contributions are asked for. The Red Cross is, in a sense, its sponsor and the Red Cross will undertake to make up any deficit.

Of approximately 400 AER stations in cities and stations throughout the country, the Army Air Forces operated 223 of them as of February 8.

But the Air Force branch of the AER is in no sense a separate organization. A member of the Air Forces may apply for aid at any station just as ground and supply men can apply at any Air Force station.

So if you have legitimate money problems we suggest that you get to the AER. That's what it's for. On the next page is a list of the divisions and sub-divisions and the officers in charge of the Air Force Branch, Army Emergency Relief:



Division	AER Officer
1st Air Force, Mitchel Field, N. Y.	Major F. Cassidy
2nd Air Force, Spokane, Wash.	Capt. Jack Green
3rd Air Force, Tampa, Fla.	Colonel J. N. Douglas
4th Air Force, San Francisco, Cal.	Capt. T. Kendall
Air Service Command, Patterson Field, Ohio,	Major Loren Robinson
Air Transport Command, Air Forces Annex Nat. Airport, Gravelly Pt., Va.	Capt. A. Goodman
Dist. of Columbia, 703 Maritime Bldg.,	Lieut. Col. Dudley S. Dean
Flying Training Command, T & P Bldg., Fort Worth, Texas	Major Walter Dunham
Gulf Coast Sub-Div., Randolph Field, Tex.,	Major Henry Stein
Southeast Sub-Div., Maxwell Field, Ala.,	Captain F. C. Peck
West Coast Sub-Div., Santa Ana, Calif.,	Captain G. H. Teeple
Materiel Command, Wright Field, Dayton, O.,	Major John Masner
Tech'l Train'g Command, Knollwood Field, N. C.,	Major H. V. Carson
Sub-Div. No. 1, Greensboro, N. C.,	Lieut. John J. Gerlach
Sub-Div. No. 2, St. Louis, Mo.	Capt. E. R. Elbel
Sub-Div. No. 3, Tulsa, Okla.	Capt. Earl Knighton
Sub-Div. No. 4, Denver, Colo.	Capt. C. Goldsbury
Sub-Div. No. 5, Miami Beach, Fla.	Lieut. C. Linden
Troop Carrier Command, Stout Field, Indianapolis, Ind.	Capt. O. L. Heath

Air Forces Aid Society

THERE is, within the Air Forces, another agency called the Army Air Forces Aid Society. This is solely Air Force, and not an emergency fund. In fact, the fund will not be used until after the war. Then its function will be to assist Air Force personnel and their families in rehabilitating themselves in regard to education, employment, financial aid, etc.

The Aid Society is building up a trust fund from voluntary gifts and contributions which it is allowed to accept although no solicitation of funds can be made at the present time. A number of writers, for instance, have assigned their pay or royalties to the society.

A Memorial Division has been created within the Aid Society which makes it possible for those wishing to make a contribution in memory of a friend or relative to send a sum of money, in lieu of flowers, to the society's trust fund. Any gift, however small, may be sent to the Society, which in turn will forward a card, bearing the donor's name, to the bereaved widow or family, explaining that a sum (amount undisclosed) has been contributed to the trust fund in memory of the deceased friend. This memorial will be perpetuated on the official rolls of the Society. These contributions will become part of the fund established to aid and assist Air Forces personnel and their dependents in distress after the war is over.

Voluntary donations may be sent to the Army Air Forces Aid Society, Inc., Room 703 Maritime Building, Washington, D. C.

Weather Training School

THE Weather Training School of the Air Forces has been expanded and relocated at Grand Rapids, Michigan. Under jurisdiction of the Technical Training Command, the school was formerly operated on a smaller scale at Chanute Field, Illinois.

To qualify for the school students must have completed two years of college training and at least one year of college physics. After nine months' training, students qualify for commissions as second lieutenants.

A new course, not before offered, will qualify a number of cadets as Aviation Meteorology Cadet Instructors, who will be assigned as second lieutenants to flying schools to instruct flying officers in meteorology.

New Air Force Award

IT TAKES a lot of drivers and automotive mechanics to keep the expanding Air Forces going. And now this assignment has been recognized. A silver badge for vehicle drivers and mechanics is now in production and ready for distribution. Each qualified vehicle driver and mechanic in an organization of the Army Air Forces, who is regularly assigned to duty in the capacity of driver, assistant driver or automotive mechanic, will be awarded a badge with an appropriate bar indicating the specific individual qualifications.

To qualify for an award a driver must: (1) Pass aptitude test and standard driver's qualification tests (practical and written) as prescribed by FM-25-10 for wheeled vehicles or FM-17-5 for track-laying vehicles. (2) Perform duty for a minimum of three months as a driver or assistant driver of an Army vehicle without traffic violations and with an accident-free record and a rating of "excellent." (3) Be assigned to duty as a driver or assistant driver of a vehicle. (4) Have not had award revoked for cause during the previous six months. To qualify for an award an automotive mechanic must: (1) Complete a standard vehicle mechanic's course with a rating of "skilled" or have sufficient previous experience as an automotive mechanic to justify a skilled rating. (2) Perform duty for a minimum of three months as an automotive mechanic, second echelon or higher, with a rating of "excellent." (3) Be assigned to duty as an automotive mechanic, second echelon or higher. (4) Have not had award revoked for cause during previous six months.

Distribution of awards will be in accordance with W. D. Circular 248.

WAR DEPARTMENT

Men and Women of the Army of the United States:

Maintenance of trucks, tanks and all the vehicles of war at a high standard of performance is as important to the success of the Army as the physical fitness of its personnel.

The Army supervises programs to insure the continuing health of its men and women. Maintenance of the same degree of perfection in vehicles depends squarely upon their crews.

Whether you are in a training camp in the United States or in the forward line of a combat area, "readiness for battle" must be the standard by which you judge the condition of this equipment which has been entrusted to your care.

The whole long chain of production and supply—from assembly at the factory to delivery on a distant shore—is severed if a vehicle's high perfection is permitted to deteriorate through lack of responsible care.

I call on every man and woman serving with the Army of the United States to unite in a campaign of preventive maintenance designed to abolish the menace of mechanical failures and to get the most from the fine machines which industry has provided.

This is your responsibility. I depend upon you to see it through.

Henry L. Stimson

SECRETARY OF WAR.

Missing Parachute

BASE OPERATIONS at the New Orleans Army Air Base reports a parachute missing and requests that Air Force organizations inventory parachutes at their stations. If Type S-1 No. 39-2834 chute is located, it is requested that it be returned to the Sub-Depot Supply Officer, 48th Sub-Depot, Kelly Field, Texas.

Forbidden Fruit

IN THE December issue we devoted an article to the boys who insist on wearing military uniforms despite the fact they're not in the service. We've been asked to add that women—wives, sweethearts, mothers, sisters—are also offenders in their wearing of military insignia, and that Air Force wings and lapel buttons too often assume the status of fraternity pins.

It seems that the law applies to the ladies as well as the men in prescribing a fine up to $300 and/or imprisonment for any person not an officer or enlisted man of the armed forces convicted of wearing the duly prescribed uniform "or any distinctive part of such uniform."

Bombardment on Display

A PHOTOGRAPHIC EXHIBIT, graphically showing the devastation wrought by bombers of the Royal Air Force on industrial areas and transportation centers in Axis-controlled cities of Europe, has been on display recently at the War Department in Washington.

The scenes were recorded by RAF photo-reconnaissance planes, sometimes within a few hours after big raids. Shown in unusual detail is the devastation at Lubeck, Bremen and Osnabruck; the shambles left by block-busters and incendiaries at Wilhelmshaven, Dusseldorf and Cologne, and the damage done at several French and Italian ports.

Squadron Leader G. A. Morris, chief of photographic interpretation for the RAF Bomber Command, accompanied the exhibit to Washington. He explained that its primary purpose was to show the expediency of attacking production at its source, rather than waiting to destroy the weapons of war after they had reached the battlefronts.

—THE EDITOR.

LETTER HOME

By Captain Thomas G. Lanphier, Jr.

The writer of this letter is a member of an AAF fighter group in the New Caledonia area. His father is Lt. Col. Thomas G. Lanphier, Chief of the North American Theater for Air, Military Intelligence, G-2.

December, 1942.

Mother and Dad:

Still in the pink and finding the time passes quickly at last. Back in —— after we'd attained a certain ability and experience we all felt we were marking time—and wasting time.

Up here we are doing what we've been trained all this while to do—and in the short week we've been here we've helped the cause no little. You're doubtless reading of our daily efforts in the line—I've gotten in fourteen hours of combat in the air—not all of that is fighting of course, most of it is getting to and fro. We are no longer outnumbered and poorly equipped—we're well set up and have lots of company.

It's the same old story it has been in other wars—some few of the lads have too much imagination and aren't of much use but the great majority go at it hell-for-leather, which is best. Our opposition can't seem to cope with aggression—we've been quite successful in bulling right into them and scattering them to the four winds.

Things are much better all around here—than they used to be. Living conditions are halfway decent and we get enough rest now that we aren't harassed the way they used to be here.

We are, of course, fighting a different sort of war than are the men in the trenches—and the effects (whatever they're supposed to be) of battle don't show on the pilots the way they do on the foot soldiers.

Our flying units are pretty much the same thing a fraternity house used to be—all young men, few of these the grim and "hard bitten" characters *Time* loves to depict. Most of the flyers here have been my cohorts, on and off, since we left the States—a lot of them I went to school with, back in training days.

We lose a boy now and then but it's rare that a pilot fails to get back to our base, even when shot down. Things move pretty swiftly and we don't seem to feel the concern we might feel at other times—when one of them fails to return. Can't afford to, I guess.

The thing that impresses me is the way almost all of our pilots—the loud ones and the quiet ones, the hard ones and the soft ones—stick together when it gets rough upstairs. That's our saving factor and one the other people don't utilize very much. We stick together and work together and it pays dividends.

I've been flying in front of four and eight men on all my flights—I worried at first about the responsibility but things have worked out so that we've all come back from every flight—and did a lot of damage to the other team while at it—so I don't fret about it much anymore. I destroyed two planes on the ground the other day. They don't count on the "record" as victories—but they'll never fly again which is what counts. All the business about "how many Japs did so and so get"—is pretty much nonsense.

There are men here who'll have hundreds of hours in combat—good men, the best—who only have one or two Nip planes to their credit. But God only knows how many guns they've wiped out strafing, how many ships they've sunk dive bombing—how far and how well they've led their men out and *back* safely. Some seem to have the good fortune to find opposition and get a good crack at them—others fly for hours and never get a shot.

I, and the people with me, seem to have the knack of finding excitement—two of us have planes shot down to our credit and the whole outfit has played hell on several occasions with the Nip cause.

The types of flying and fighting we're doing are myriad—some of it things never dreamed of in training schools or home guard squadrons and a pilot girded for a flight is a sight to see. There is no distinguishing uniform—everyone wears what best suits him—but all wear enough to cover them from head to foot—tropical heat regardless—in case of fire.

A helmet and goggles, a radio headset, an oxygen mask, a throat mike, a life vest, a parachute (in which every kind of first aid and emergency ration is stored somehow), a hunting knife, a gun in a shoulder strap (for comfort in the cramped cockpit), a watch, dog tags, heavy shoes, gloves, pockets full of miscellaneous items and coins (for largesse to natives; in case of emergency the natives will help unbelievably for a shilling or less).

My uniform aground is a fatigue hat—fatigue jacket and trousers and a canteen—we must drink close to a gallon of water per man per day. Baths are scarce but drinking water is everywhere—and has to be. Salt tablets every hour are routine—vitamin and atebrine pills a daily dose and effective too. We all feel better here than we did in ————, lassitude got us there soon after we arrived. Doing nothing, day after day—as we were there—is the hardest thing of all to endure.

We're actually "eager"—as they say here—and are going at the business hard and fast. I don't know how we'll feel a month from now—but along about then we should be pulling out for a rest (that's the policy here now)—so it shouldn't be bad.

If Charles gets down here he'll be in rare company—the marine pilots are really good—and fine fellows. They're deadly shots—they've had hours of practice the Army somehow hasn't managed to give its pilots. Most start off with a bang and keep it up—most Army pilots have to learn their shooting in combat. They catch on quickly, but they ought to have the practice before they get here—as do the Marines.

I expect a couple of turns up here—an interval of rest between them—and then home!!!! I don't imagine they'll let us stay in the States forever—when we *do* get home—but a few months is all any of us ask.

I sometimes wonder if people well established at home fully appreciate what they have. The one thing above all else that every man out here longs for—is a sight of home and the ones he loves.

I feel, now, that I'm earning my chance to go home. However long they keep me here is all right—things are being accomplished here and there's a feeling of getting a job done throughout.

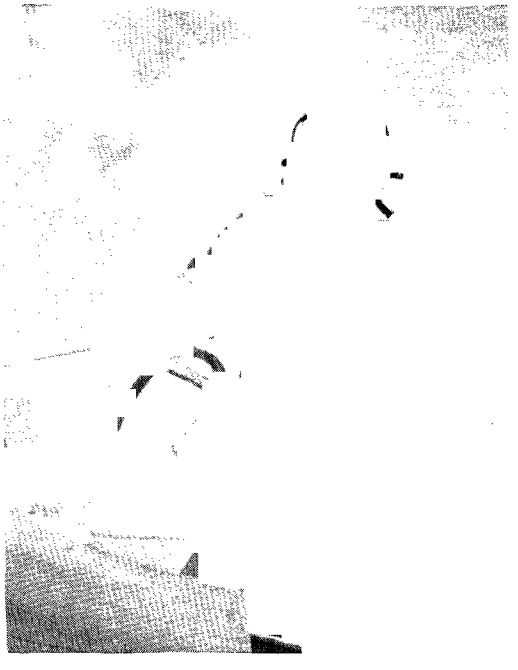
I want you all to know that I'm well and well fortified to fight my little corner of the war.

My love to you all.

Tom

WHAT YOU

The author of the accompanying article leaves his kite after a mission over El Alamein.



Combat horse sense from a P-40 pilot who fought with the RAF during the big push in North Africa.

HYPO SQUAD flew at 11,000 feet as high cover to Borax squadron, flying just below us with the Wing Commander leading. Dust and haze had made it thick all the way up to 10,000 feet and we felt better as we climbed to 15,000. Our silhouettes would not stand out so prominently against the soup below.

As we neared the bomb line five tiny dots suddenly broke the haze way off to our right. "Borax and Hypo Squadrons, five 109s at 3:00 o'clock below. Let's keep our eyes on them," called the Wing Commander. There was going to be trouble this trip, we thought; they're coming up too early. Oh well, easy come, easy go. Our weaving changed from a regular pattern to a violent and shifty motion and we bit large washers out of our parachutes.

As the 109s climbed up and around in back of us they became more difficult to see. They changed from tiny black dots against the haze to tiny light blue specks, and then finally disappeared into the sun about 3,000 feet above. We knew of their presence there only from the occasional flash of the sun reflecting off their perspex.

"All right, boys, they're in the sun now. They'll be coming down. Hypo top cover. Be ready!"

We went on toward the target. They were there, we knew, even though we couldn't see them. Just as we arrived at the motor transport concentration we were to bomb, five or six more tiny blue dots appeared overhead and down sun from us. They came in closer and we saw them dip their wings as they watched our movements.

"Ach, Herman," their leader was probably saying, "A Hurricane party! This will be easy meat. It iss my turn first."

The Hun has taken a long while to realize the sting a P-40 carries. He comes down on what he thinks is a Hurricane and then when he gets shot down he swears it was a Spitfire that did it.

"There's five, six more above at 12:00 o'clock," says the Wing Commander.

SEE WON'T HURT YOU

By LIEUT. CHARLES W. TRIBKEN, JR.
U. S. ARMY AIR FORCES

"Hypo Squadron, stay above as top cover. Borax squadron peel off and bomb! Going down!"

We stayed above and watched the 109s more carefully than ever. As Borax squadron went down the 109s became more noticeably excited. Two of the down-sun party detached themselves and made a feint after the tail men of Borax as they were bombing.

"Two coming down on you, Borax green," said our squadron leader. "They're O.K.!" called the Wing C.O. who had already pulled out of his dive and was climbing back up to us. "Don't go after them!"

The other four that were down-sun started to come down on our top section.

Coming down on you Hypo top! Get ready! Turn about! And as they turned the other Huns came down from the sun. We in the bottom section had not turned, however, and we met them head-on. When they saw that we were prepared for them they continued straight down. Someone had put in a lucky burst and a 109 was trailing smoke. Everything was a shambles now. Just a cloud of aircraft whirling around. We in the top cover had jettisoned our bombs as we were attacked. The Wing Commander called, waggled his wings, and we re-formed and went home. We all had enjoyed it and no one had picked up a scratch.

That describes a more or less typical mission in the desert. It was moderately successful, because even though we were attacked we managed to get at least half our bombs on the objective and the other half might also have done a little damage. We were not out to shoot down the enemy, but we had probably destroyed one with no loss to ourselves.

It might not sound very brave or daring, but from long experience we had found that the "brave and daring" man may be missing after a few shows. He runs off after the Hun and finds himself in a most embarrassing, out-numbered position, and if he does manage to return he is pretty well holed up and much less daring.

I have tried to illustrate what a show is like and what you may expect to see. The Hun is always 2,000 feet or so above. The German and Italian fighters can out-climb you. But they cannot out-dive or out-maneuver the P-40. So you must make them fight where your superior characteristics will be put to use. Allied fighters depend on various types of defensive formations and have achieved great success with them.

PLEASE note that the entire success of this operation depended upon the fact that we saw and knew exactly what the Hun was doing all the time. If he had been able to catch us unawares, we would have been attacked and broken up with losses long before we reached our objective. However, he knew that we knew he was there and, as a result, we made him play his best strategy and still he failed. All because the Wing Commander and the squadron knew what was going on.

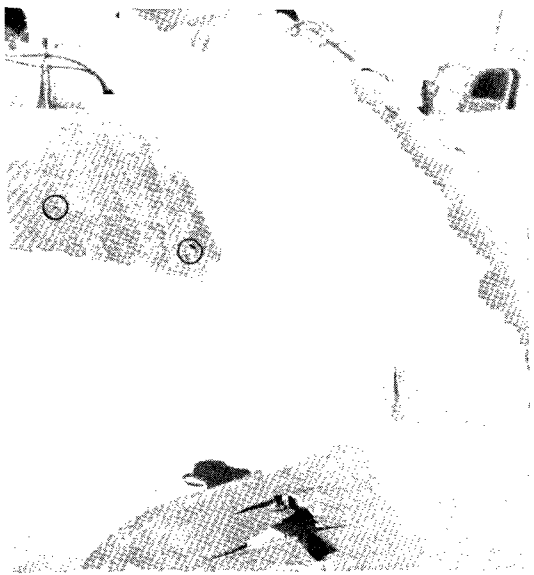
See him before he attacks! This cannot be stressed enough. The man who gets shot down is the man who goes out on mission after mission and sees nothing, or only half of what is going on. He leads a happy life because he never realizes his danger. Perhaps he's watching a good tank battle on the ground or a pretty peasant girl milking a cow (and she waved to him—how sweet). But he missed the fact that Emil and Heinrich and Ludwig are up above him arguing to beat hell as to who should have the first crack. (Emil has had first chance for two times running and it isn't fair.)

If he should be lucky and manage to get shot down on the right side of the lines he'll say, "Well, the first thing I knew there was some white stuff going past my wings and then I was on fire and so I jumped out. Can't I get a flying boot for that? I walked a mile before I was picked up." By this time his commanding officer is fuming to himself. ("Why the hell did you get shot down and why the hell did you bother to come back at all? Who can I push this guy onto?") But, being a kind hearted soul, he inquires to see if there isn't some scratch or a broken fingernail that the M.O. can use as an excuse to put our hero in the hospital for a month or so.

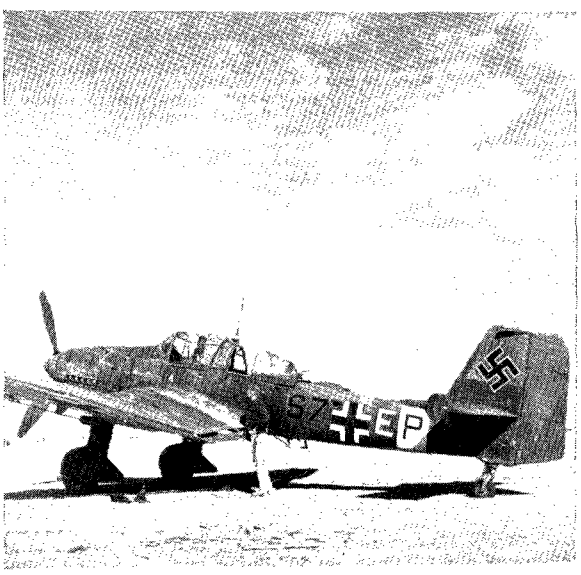
What are you going to see? Not a great deal. Four or five very tiny blue or black dots, in sort of a rough line astern or more probably (and you really shake when you see this) just as a flash in the area of the sun. They're up there and they see you! Recognize them as Huns even though you don't see their wing tips or tail or spinner. In Africa all Allied (Continued on Page 32)

PHOTOGRAPHS BY THE AUTHOR

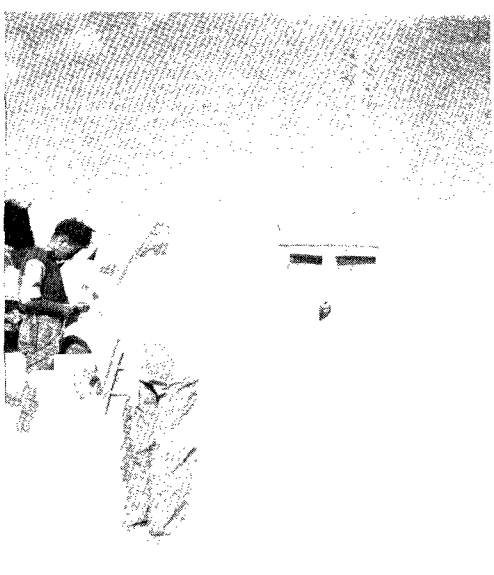
Even the Squadron Leader sometimes was caught unawares. Note the scars left by a 20 mm. cannon shell and machine gun bullets (holes circled).



Inspecting a Stuka left behind by the retreating Germans. Such planes are used to bring up supplies from the rear.



An intelligence officer interviews a group of RAF fighter pilots who have just returned from a mission over enemy territory.



THE ARMY'S *Flying* WINDMILL

By Colonel H. F. Gregory

WRIGHT FIELD

FLYING a designer's dream plane on its first flight is a thrill that only can be eclipsed by flying a designer's "freak", such as the Army's first successful helicopter, through its official flight tests.

It was the privilege of the author to act as project officer for the development and procurement of the Army's first practical and successful helicopter aircraft—a freak that may revolutionize design of the civilian "taxi-plane" of the future.

Nine months ago this wingless craft, after a cross-country flight from the Sikorsky plant at Stratford, Connecticut, parked itself in front of the Wright Field operations tower, not on the line with other aircraft, but hanging 25 feet above the concrete apron. Then, upon receiving clearance to land, the Army Sikorsky Helicopter dropped gently —and vertically—to the ground.

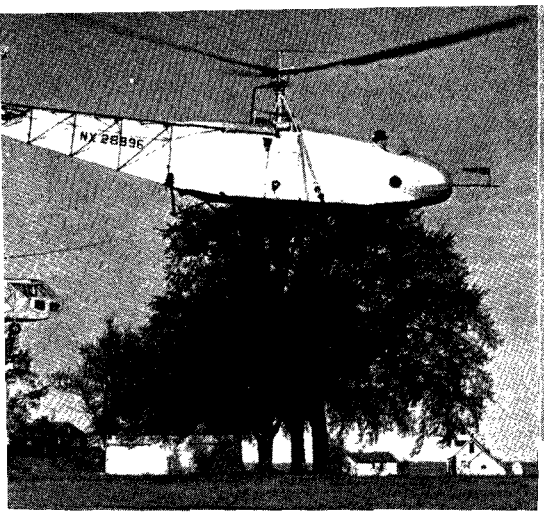
Since that Sunday on May 18, 1942, the flying windmill has gone through eight months of flight testing, demonstration and pilot training at Wright Field. As a result, more of them are scheduled to be built for service testing under field conditions.

The helicopter has emerged from the experimental stage and is ready for the tests that may prove it to be capable of performing a great variety of military missions.

This new aircraft can't attain the speed of a P-47 and it can't carry the load of a Fortress or a Commando. But it can do many things that a liaison plane cannot do.

The helicopter will rise or descend vertically; it will fly forward, backward and sideways, it will spin around on its vertical axis like a top. It will hover motionless in the air at its vertical ceiling or a few feet above the ground; it will land on a platform 20 feet square.

During test flights, the helicopter time after time defied the impossible. In one cross-country trip the visibility dropped to less than one-half *(Continued on Page 29)*



DAWN OF A New Era

The pilot's own story of the helicopter's first cross-country flight in the Western Hemisphere.

The conventional model of the helicopter, piloted by its developer, flies low over a Connecticut meadow with the Army's new model in the background. Note that the Army version has an enclosed cockpit and fully-covered fuselage.

Completing the delivery of the Army's helicopter. Colonel Gregory, author of the article on the opposite page, greets Mr. Sikorsky at Wright Field. Mr. Orville Wright grins with approval. In the photo below, Mr. Sikorsky carries on a telephone conversation with the occupants of the helicopter while the aircraft hovers in the air.

By C. L. MORRIS

ENGINEERING TEST PILOT, SIKORSKY AIRCRAFT DIVISION, UNITED AIRCRAFT CORPORATION

THIS is the chronicle of a new era's birth. It was written in June, 1942, when comparatively few people knew the meaning of the word "helicopter." Many helicopters have been built, but none could be considered successful until 1937 when the craft designed by Professor Focke in Germany astounded the world by flying inside a crowded sports palace. Little has been heard of the German ship during the last three years, but in 1939 Igor Sikorsky, in the United States, undertook to develop a helicopter along quite different lines. In 1940 this craft was demonstrated publicly for the first time. In 1941 Mr. Sikorsky broke the official international endurance records for helicopters. Finally, in 1942, the first U. S. Army helicopter was delivered. This is the story of that delivery flight.

THE story begins on May 13, 1942, in a little triangular meadow close to the Sikorsky Aircraft factory in Stratford, Connecticut. It was a bright morning, slightly on the warm side, with a gentle spring breeze barely stirring the leaves of the stately elms that bordered the field. Grouped along the road were a couple of dozen workers from the plant. Their interest was focused on the aircraft in which I sat, making final arrangements to take off on the first cross-country helicopter flight in the Western Hemisphere, and the world's first delivery flight of a helicopter, as far as we know. It was a flight in which records were destined to be broken—but the records would not be recorded because we were forced to cloak this occasion in secrecy.

I sat inside the blunt-nosed cabin, reading the instruments that would tell me when all was ready, arranging maps and parachute harness, and watching the rotor flicking overhead in powerful rhythm.

Several of my friends drifted out of the crowd and stuck a farewell hand in the open window. Mr. Sikorsky stood nearby, nervously chewing at the corner of his mouth. His keen eyes flashed from under the familiar gray fedora as they searched every detail of the craft to detect any sign of flaw that might develop.

I knew on this May morning that his vision would be doubly sharp. Mr. Sikorsky was not wholly convinced of the wisdom of this flight; he felt that this "first-of-the-type" should be handled with kid gloves and be delivered to Dayton by higway truck, thus eliminating the potential hazards of a cross-country flight in a totally novel type of aircraft that had had less than twenty flying hours since its wheels first left the ground.

It is understandable, therefore, that I experienced calm reassurance when Mr. Sikorsky walked quickly to the ship, thrust out his hand and said, "Well, Les, today you are making history!"

The engine labored and roared its crescendo as I pulled upward on the pitch control to rise off the ground. The ship lifted vertically to ten or fifteen feet; then I eased forward on the stick and we started off across the field. Sweeping in a gentle circle, we swooped low over the clump of upturned faces and waving hands—then on over the factory in an easy climb to 1,500 feet.

An automobile with a large yellow dot painted on its roof was already speeding out of the factory gate. That car was to be my shadow for five days. In it were Bob Labensky, the project engineer who had cast his lot with the penniless Sikorsky of nineteen years ago; Ralph Alex, his assistant, who had labored endless days and nights to bring this craft to flying condition; Adolph Plenefisch, shop foreman, who had all but lived with the Sikorsky helicopter since the first nerve-wracking flights in 1939; and Ed Beatty, transportation chief, who had elected himself to be the driver.

I quickly lost them in the elm-tunnels of Stratford, but my maps were marked with the exact route they would take, so I followed it closely, always ready to land in some little field beside the road should the slightest thing go wrong. They would see me as they drove by, and delays would be minimized.

Danbury came in sight a little behind schedule. I was flying at 2,000 feet now because the land was rising. At that altitude a moderate headwind was slowing my speed. Sixty miles an hour had been chosen as the best cruising air speed for the flight—easy on both ship and pilot. A fifteen-mile headwind made a big (Continued on Page 38)

Checking and Double-Checking Navigation Devices

By Colonel Thomas L. Thurlow

ENGINEERING DIVISION, WRIGHT FIELD

PET devices, intended by their inventors to eliminate all mechanical and human errors in navigating the skyways, are sparking the research of the instrument laboratories at Wright Field.

Never satisfied with the "best," laboratory technicians continually examine and test each new device submitted, regardless of the experience of the inventor. Although hundreds are discarded, some few are proved practical by the triple-standard of accuracy, economy and speed of operation.

In this sifting process many superficially "perfect" devices turn out to be absolute duds for combat flying where the navigator must make his computations under extremely difficult conditions. Wright Field's job is to spot the phony systems and to encourage development of the ones that can be depended upon to bring our planes home.

Despite the intricacies of this mathematical science, it is encouraging to note that some of the most promising improvements in devices to aid navigators are being submitted by non-navigators. Recently a synchronous ground speed meter was developed by an officer of the Medical Corps and, of the many hundreds that have been submitted, his is the only one that has proved to be novel in working principle.

As soon as installation of another device —which determines altitude above the terrain—is completed in more airplanes, the medico's synchronous ground speed meter will be put through the final tests that may prove it to be practical.

The mechanical devices for the reduction of observations comprise a group that primarily attracts the inventive prowess of non-navigators. Because only geometry and common sense are involved, the ambitious would-be navigators frequently slip into ruts that brand their instruments as "phonies."

The geometry of the inventor often breaks down in making computations; sometimes he founders on the problems of "scale"; invariably his enthusiasm for his own creation tempts him to make outlandish claims as to the speed and accuracy possible with the device.

Such people usually have just discovered navigation—yet, all of the devices they propose can be seen in any museum of astronomy.

What an amateur proposes as a new and original short-cut method often is found to be a system previously tried and rejected. Some of the new proposals are sound for training and for certain types of flying conditions. The only systems that can be adopted, however, are those that serve the navigator under all flight conditions, those that require less than four minutes of computation, and those that can be economically constructed, installed and maintained.

All devices using arcs to represent the various circles, celestial and terrestrial (involved in the reduction of sights), are essentially alike in principle. Such an instru-

ment is pictured on Page 33. The navigator tyro or old-timer, who has not toyed with the idea of designing and constructing a simpler and better device for the solution of the oft-met wind triangle, for the plotting of lines of position, or for the reduction of celestial observations, is indeed much harder to find than Diogenes' "Honest Man." In many cases, the navigator whittles his pet device from a sheet of celluloid or a piece of brass, convinced that his invention will end all navigation devices. He then begins his crusade to gather converts.

Despite the flood of such inventions, the Materiel Center at Wright Field welcomes the steady stream of proposals. Although hundreds of devices are screened, the value of the few devices that have practical features compensate many times over for the effort expended to uncover them. In addition to tangible developments, new ideas and new methods proposed serve as stimulants for the extensive research continually being carried out in the laboratories.

Navigation, as an ancient art, has attracted the attention and thought of countless thousands for centuries. Because the field has been so extensively exploited, innovations do not appear with great frequency. However, they appear. The Air Almanac is an outstanding example.

THE Air Almanac is believed to be one of the greatest contributions to navigation in several decades. It has transformed celestial navigation from a very painful art to a near painless one. It has popularized the lunar observation—rarely attempted before appearance of the publication. It has made the daylight fix by two bodies possible during those portions of the month when the moon is visible and well located.

Synchronous ground speed meters, which are proposed every week, may vary in external appearance but in principle they are as alike as peas in a pod. Yet, it took a non-navigator, the medical officer previously mentioned, to develop an instrument with a new working principle.

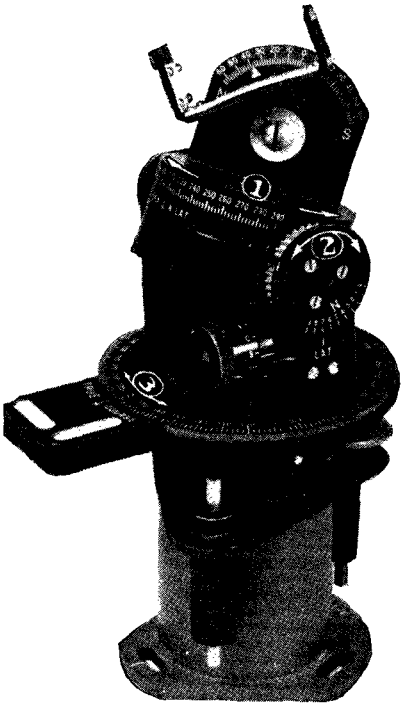
In the design of devices for the solution of the wind triangle, wind star problems, or of equipment for line of position or other plotting, there are few pitfalls to be encountered. Hence computers and plotting equipment of every conceivable type are submitted in astronomical numbers. The criteria for acceptance must be based upon many factors; for instance, the curves of cost vs. utility are of primary importance. More than 100,000 of the standard E-6B dead reckoning computers have been purchased and adopted for general use in the service and navigation schools. To change the type would involve a change in the navigation school curriculum, the junking of the present instrument, the writing of Specifications and Technical Orders covering the new device, the initiation of procurement of the new computer, and, most serious of all, a time delay of many months in getting the device into production and delivered to service units. Therefore, the new computer must be so completely superior to present equipment that it would render the device it supersedes obsolete before it could be adopted to replace the satisfactory computer already being used.

The trick devices get a thorough testing but almost all fall short of high Air Force standards.

Inventors who develop drift and ground speed meters other than the visual type run into trouble in a big hurry. Two such types are the integrating accelerometer and those devices which attempt to utilize the vertical component of the earth's magnetic field.

To determine ground-speed and drift by integrating the horizontal accelerations encountered by an aircraft in flight, the inventor must succeed in construction of an accelerometer that will measure all accelerations, from the most minute to the most violent. To date none have been constructed. Accelerations must be measured with almost prohibitive exactness because the error in the final computation –ground speed – *is cumulative.* Since only horizontal accelerations can be used, the device also must be gyro-stabilized. However, when an accelerations occurs, the accelerometer becomes unbalanced and processes the gyro upon which it is mounted until the horizontal component is no longer being measured. In addition to the foregoing difficulties, accelerations must be integrated instantaneously—or with an invariable lag. Electric motors, watt-hour-meters and similar devices are impractical because of the inertia of their rotating parts. Assuming that all of the other difficulties can be overcome, how then is instantaneous continuous integrating to be accomplished?

AAF Type G-1 Astro-Compass



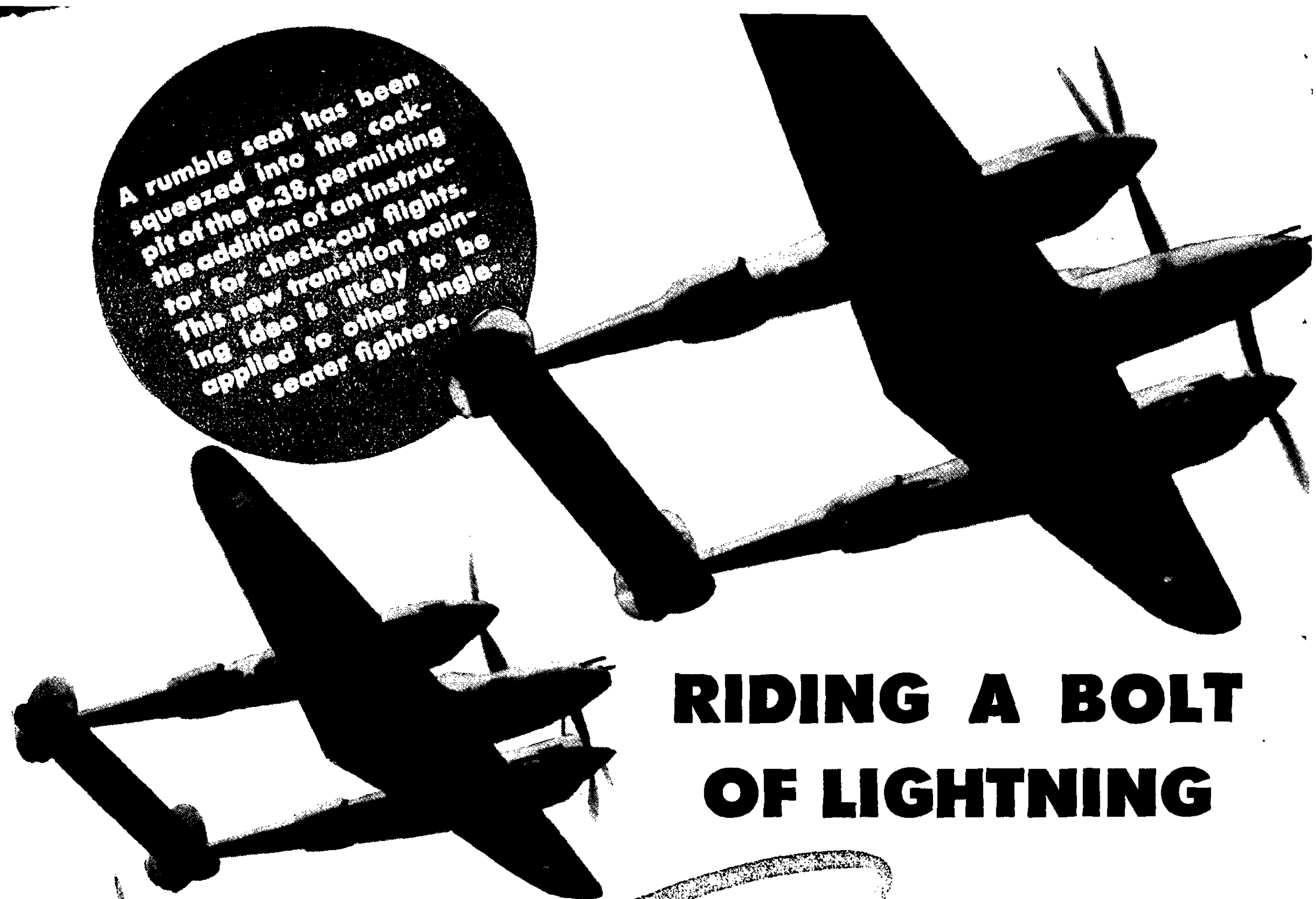
Many proposals have been submitted to determine ground speed by measuring the charge produced in a horizontal conductor moved through the earth's magnetic field (using the vertical component thereof). The theory is that "lines of force are cut and therefore a charge is produced in the conductor"; hence "measure the charge and there is the ground speed."

To astound the inventor of this type of ground speed device (and the reader alike), it can be stated that "there are no lines of force to cut." Such a statement deserves an explanation.

IT is agreed that the earth's magnetic field in a small cube is uniform. Let it then be stated that the well-known "lines of force" do not exist at all but are used as a *convenient analogy* to show the "direction" or "flow" of a perfectly uniform magnetic field, and to offer an explanation of what happens when a conductor moves through it. Thus the earth's field is likened to a small cube of sea water which is entirely uniform but has a quality of "direction" which we indicate by "lines of force." Now, if no lines of force are cut, why then is a current induced in a loop rotated in the earth's field? The answer to this question conforms entirely to physical realities: "The current induced is due entirely to the *variation of the amount of flux* (with due regard to 'direction') enclosed by the loop, which variation results from the rotation of the loop." Thus, the induction is due to a *change in flux density* in the loop and not to the cutting of lines of force. Furthermore, since there is no alteration of flux density when a single conductor or a *non-rotating* loop is moved through a uniform field (such as the earth's), no charge or current is generated.

The lines-of-force advocate admits that no current is generated in a translated, non-rotating loop, maintaining that opposing e.m.f.'s counteract each other. His opponent argues that there is no change of flux density and hence no current generated. Both agree in regard to the final result in the case of the loop. They disagree in regard to the single conductor, one maintaining that a charge is developed and the other that one is not. When an attempt is made to measure the charge, the circuit is closed, the conductor becomes a loop and there is no current flow, as both contestants have agreed. Hence, no ground speed.

Perhaps some of the above argument is sacrilege. It illustrates, however, that the inventor proposing to use the earth's magnetic field must tread on solid ground as far as fundamental physical conceptions are concerned. In other types of non-visual ground speed meters the inventor is quite likely to find himself involved in a morass of mechanics. This is especially true when gyros are involved. Very frequently the designers of the "arc" group of instruments become so thoroughly involved in their celestial and terrestrial geometry and so confused thereby that they eventually claim a fix from one ob- *(Continued on Page 33)*



RIDING A BOLT OF LIGHTNING

Piggy

By LIEUT. JOHN TRUESDELL
DIRECTORATE OF FLYING SAFETY

PIGGY-BACK riding in the speedy P-38 is the latest wrinkle being sponsored by the Directorate of Flying Safety for our air cadets.

The term piggy-back applies to a new two-seat arrangement in the small single-seat cockpit of the 38. With this conversion, the extra rider sits above and close behind the pilot and actually looks like he's riding piggy-back on the pilot's shoulders.

Take it from one who has had his first passenger piggy-back ride in a P-38—it really looks good. It's one thing to spend a day with the Lockheed engineers listening to performance data, but it's another thing to wedge into the capsule cockpit of the 38 with a headful of figures and to feel those figures with the seat of your pants.

This P-38 conversion, however, has earned its flying spurs for a far better reason than to prove that the ship is one of our finest air weapons. Riding piggy-back with a pilot who fully understands and can demonstrate the abilities of this fast fighter, the cadet can learn more in an hour's ride than he might in months of experimenting while flying the P-38 solo. He actually has the composite of all the experiences of the Lockheed test pilots and test engineers who lived, dreamed and rode with the ship from the drawing board on up.

Soon the Air Forces will have a number of P-38 piggy-back conversions—first to check out flight instructors, and then for flight instructors to check out cadets before they graduate to this fighter.

In this piggy-back program for the P-38, and for other single seater fighters as well, the Directorate of Flying Safety sees not only the possibility of a speed-up in turning out the finest fighter pilots in the world, but a most effective psychological weapon to combat the wild and wooly tales you sometimes hear about our new fighters.

This simple method of achieving pilot acquaintanceship with a single-seater plane had a very basic beginning. It all started one afternoon early last August when Milo Burcham, Chief Engineering Test Pilot at Lockheed, was removing the radio from the shelf behind the pilot's seat of a P-38.

Burcham decided a small to medium-sized man could conceivably wedge himself on that shelf, and he discussed its possibiliy with Rudy Thoren, Lockheed's Chief Flight Test Engineer. Now, Rudy is six feet two inches without stretching and for the first time in his life he regretted his height. At any rate, he and Milo soon were giving a careful eye to that small space in the P-38's cockpit designed for a radio rather than a rangy engineer.

Rudy made up his mind that if a road

map could fold so could he, and he was soon back at his drawing board designing a plywood seat and pocket-size desk; he managed to save enough cockpit space for all the known engineering instruments as well as several more that had been in the back of his mind for some time. Rudy was the first piggy-back passenger, with Milo putting the ship through every possible maneuver while this elongated flying engineer managed to divide his mental capabilities evenly between dozens of test instruments and keep his lunch inside him. This original trip evolved into daily flights and the highly guarded first piggy-back P-38 went to work as a complete flying engineering laboratory.

These sorties for aerodynamic science went on and up until finally Rudy and Milo were nipping along at well above 30,000 feet, recording new performance figures. This test pilot and engineer continued their flights until they knew the P-38 from A to Z.

The Directorate of Flying Safety entered the picture in the persons of Lieutenant Colonel Warren Carey, Commanding Officer of the Sixth Regional Safety Office, and Lieutenant Colonel Charles H. Hastings, Jr. Reluctant to share the credit for visualizing the possibilities of pilot indoctrination with the piggy-back P-38, Colonels Carey and Hastings insist that the idea "simply evolved" between Lockheed's Milo Burcham, themselves and progressive Commanding Officers who were approached. The credit-reluctant Lockheed gang and the Air Force officers do agree that if it hadn't been for Major General Barney Giles, commanding the Fourth Air Force, piggy-back pilot training might be just another good idea that never saw the light of day.

JIMMIE MATTERN, another Lockheed Test Pilot, took General Giles and Brigadier General William E. Kepner for their first piggy-back ride.

"I didn't spare the Generals a thing," claims Jimmie. "We did loops, rolls, Immelmans, single engine rolls, single engine take-offs and landings, accelerated stalls, and all the other so-called 'unknowns' that had caused a lot of hangar talk about the ship's performance."

Jimmie points out that Milo Burcham and Rudy Thoren took their first ride in August, and by September the Army Air Forces was already busy converting some of its own equipment to piggy-back for use in building confidence and skill in new pilots.

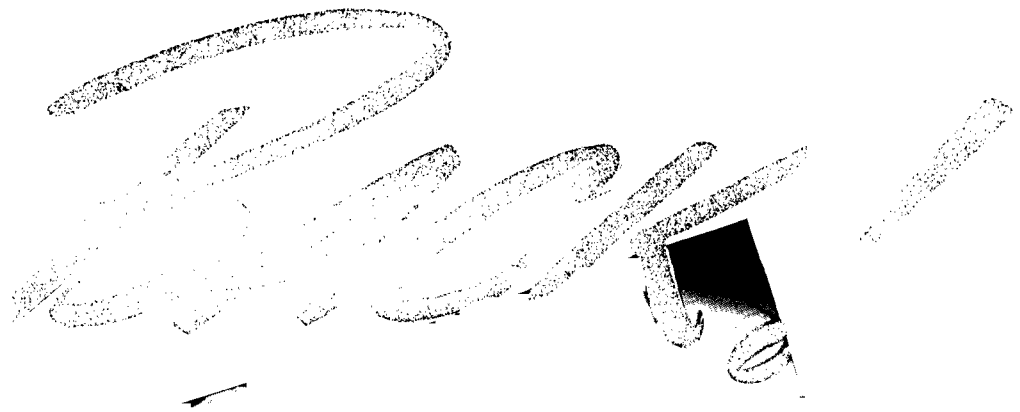
Jimmie, who has flown his 10,000 hours under all conditions, in all kinds of airplanes, all over the world, says: "Trouble in a P-38 (or in any other ship) is usually something that the pilot gets himself and his airplane into rather than the airplane getting the pilot into it." Jimmie claims that a lot of hangar hot air has sprung up about a single engine performance.

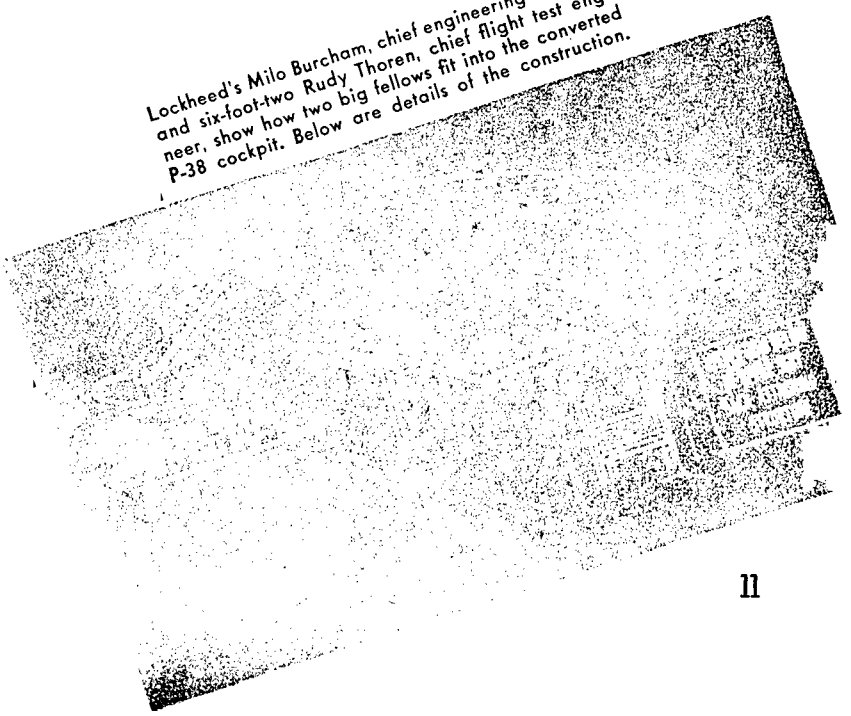
"The P-38 flies easily," he explains, "at better than 180 m.p.h. on one engine. That's faster than I ever flew in my first fifteen years of flying. On single engine the Army recommends an air speed of not less than 120 m.p.h. although actually, the ship will fly slower with complete safety."

Jimmie continues that one of the main facts concerning single engine operation is *the importance of considering air speed above everything* in event of motor failure. Pilots with only single engine experience have a natural tendency to pour the coal into the live engine, when the first thought should be *to gain flying speed* by putting the nose down and maintaining directional control even if it means throttling back the remaining live motor. Then the usual single engine procedure is to be considered and quickly and coolly executed. Loss of directional control with a sudden increase on the power of the one remaining engine can "flip the ship on its back." Jimmie cautions, however, that a thorough knowledge of single engine procedure as outlined by your check list is far more important than vaguely knowing "what to do."

"If the cadet knows this, he is perfectly safe on one engine even at the critical take-off period. All this one-engine talk might seem superfluous because the ship is designed with two engines, but as long as they make motors, there will be occasional motor failures.

"The accelerated stall is another important lesson for the piggy-back pilot to demonstrate thoroughly. At high speeds it's possible to haul back on the stick, spill the air off the wings of the P-38, and achieve an accelerated stall. Once the pilot has his first easy lesson on recovery from these stalls (just ease off on the stick) and how to avoid them in the first place, another bit of hangar rumor goes into the scrap drive." ☆





Lockheed's Milo Burcham, chief engineering test pilot, and six-foot-two Rudy Thoren, chief flight test engineer, show how two big fellows fit into the converted P-38 cockpit. Below are details of the construction.

The Meaning of Flight Control

The director of a new unit in the Air Forces explains its operation and the effect it will have on pilots throughout the country.

By Lieut. Col. George C. Price

DIRECTOR OF FLIGHT CONTROL, ARMY AIR FORCES

IF there is one thing that makes a military pilot see red it is to tell him he is going to be controlled. True, he has been in the Army and knows all about having his time regimented. But most of us who learned our flying a few years back have been pretty much the boss of our own actions once we cleared a runway.

And now Army pilots are face to face with a new animal called Flight Control. At first glance it is a pretty ornery looking beast. When you have been flying everything with wings on it for a few years, you feel that about the last thing you need is more control— you may be right, too. No system of operation could be devised that would make allowances for all the degrees of experience and ability that we have in the Army Air Force today. But where there used to be a handful of pilots with a lot of experience and ability, there are now thousands of youngsters in the air with more guts than experience.

These youngsters represent the bulk of the Air Forces today, so once again the majority rules. Either that or you could expect to have a lot more airplanes cracking up in the cornfields of the country.

Actually, this thing we call Flight Control isn't such a bad critter once you get to know it. The older airline pilots squawked to high heaven when they were introduced to Flight Control, too, but there are very few of them who would care to be without it these days.

While details remain to be worked out, we can tell now about how the system is going to work and what it will do for you and me when we want to go from here to there.

The two places where Flight Control will be most obvious are in the operations offices and in flight on the airways.

As far as operations are concerned, Flight Control means only this. The Director of Flight Control will prescribe the procedures to be followed in operations offices and will operate an inspection service in line with those procedures.

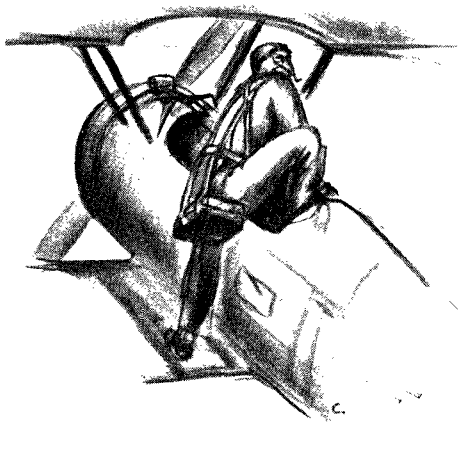
In other words, it is our job to see that everything a pilot needs to plan his flight is on hand and easily available in every operations office, including maps, weather, latest special notices to airmen and other information. It is our job to figure out what information should be there and then see that it is. Actually there won't be any considerable change in the forms you fill out or in the information you give. There will be no sudden turnover in what you have to do to get an operations clearance (Form 23).

What will happen is that the whole present procedure will be tightened up where the records and inspection show that looseness has caused accidents. The average pilot will be aware of the change only in that there will be more and better information available for him and he will be better equipped and informed for the mission ahead.

So far as Airways Traffic Control clearances are concerned, no changes of any kind are scheduled. You will get your clearance just as you do now. As now, you will report time-over at range stations along the way, but for the benefit of those who have been a little forgetful about these reports, it is going to be absolutely necessary to make them as scheduled.

Right here is where the biggest change comes in. Formerly you could report to range stations every five minutes for a thousand miles and suddenly find yourself at your destination with 200-foot ceiling and a quarter-mile visibility.

Surely, you could ask for weather and find out that ceiling was "Dog," visibility, "Horse," and a few other barnyard varieties. But pilots are pilots and more often than not we let the weather take care of itself—pretty well convinced that we can take care of ourselves. Besides, it is too much trouble to try to figure out the code unless we are already in a pickle.



What happens under the new set-up is merely this: At each Airways Traffic Control center an officer of the Directorate of Flight Control will set up shop alongside regular A.T.C. men. When a military flight is cleared through his region, he will keep track of it. He will know every time you check in over a range station. He also will have all information available on the weather, and when it looks like trouble ahead, it is his job to let you know what to do about it.

In other words, he will be doing, in most cases, only what you would have done yourself if Adolf, Tojo, and old Benito hadn't made it necessary to talk about dogs and cats when what you really want is weather dope. In the good old days when you not only could ask for weather but could pick it up almost any time while in the air, you decided before you got in trouble whether you should sit down at the nearest open airport, turn around and go home or maybe try an alternate. With weather under a war-time hush-hush, Flight Control officers will do that job for you.

There is a lot of flying that must be done in this country under all kinds of conditions if the pilots we put in combat are going to be able to cope with conditions they are bound to meet. We know that. And the last thing we want is a bunch of namby-pambies flying around in military airplanes. On the other hand, a ship cracked up on this side of combat hasn't done anybody (except the enemy) one little bit of good.

There you have it—this thing called Flight Control. More standardized service at the operations office before you leave and somebody on the ground who wants to see you safely through while you're in the air. That is the guts of this whole program. It's got some teeth, but the basic principle is service to flying personnel—service to an Air Force that has got a tough job that must be done in a hurry. ☆

WHAT KIND OF OFFICERS WILL THEY MAKE?

By Major W. R. Cunningham, Jr.

COMMANDANT OF CADETS, ADVANCED FLYING SCHOOL, FOSTER FIELD, TEXAS

Cadet training is a challenge to every instructor; discipline and morale are inseparable.

WITH the Army Air Forces turning out commissioned officers on a mass production basis largely through the graduation every few weeks of hundreds of cadets, the question of discipline during cadet status as opposed to morale during the same period, has created several schools of thought among staff officers responsible for their training and those in tactical units to whom they may be assigned after graduation. Poor discipline and lack of officer qualities in newly created officers sent to them by the training centers have caused the tactical leaders to feel that too many specks have been left in the apple before they get it for the final polish.

Of course, the well worn law of averages will reflect that out of any barrel the size of the Aviation Cadet group, there will always be specks and even a few completely rotten apples. These inevitably will slip through the system and past the final inspection, to turn up later in some tactical or combat organization where they create the fear of infection from all others from their school in the minds of their new commanders. A general bad impression is very easy to win but very hard to lose. Every training establishment from preflight to advanced is aware of this fact and doing the best it can to turn over to the next succeeding phase a material that can be developed further into the type of finished product every commissioned officer is supposed to be. And, being aware that any bad impression made by a new officer as he steps out to play his more important role in the Army usually reflects back no farther than his advanced school, those responsible for that phase of training find themselves casting about deeper and deeper into the problem of the right way to handle these men in order to get the desired result.

Aviation cadets represent a highly intelligent group of physically perfect young men, most of whom haven't outgrown the clean, healthy and perfectly normal "orneriness" we secretly hope to find in our own young sons. Yet, in order to make him of any value as a member of this highly geared Air Forces team, he must be taught mental and physical control and *(Continued on Page 28)*

From the front, this haystack blends naturally with the surrounding countryside—

But viewed from the rear, it becomes a hangar for a full-sized dummy of a P-40 fighter.

CAMOUFLAGE IS A MUST!

By LIEUT. GEORGE BRADSHAW

IN combat zones, who should practice camouflage?

The answer to that is straight and simple: Everyone.

Successful concealment in the field becomes possible only when it ceases to be thought of as the business of a few experts, and becomes the personal and daily concern of every member of the Forces—from the front line to base camp.

What is camouflage?

Camouflage is any and every means of hiding or disguising yourself from your enemy; misleading him as to your position, strength and intention; confusing him so that he wastes his blows and falls into your ambush.

How can everyone practice camouflage?

By following the discipline set down by the camouflage officer.

Every human activity, from planting beans to building a railroad, leaves a visible mark on the face of the earth. The marks left by an army are completely different from those left by a civilian population and if that were not so there would be no camouflage problem.

Therefore, the most important camouflage rule which *everyone* can obey is: *Do not make tracks.* Walk and drive within the limits staked off by the officer. It is obvious that if a position, no matter how cleverly concealed, has dozens of tracks leading up to it, the enemy will not long remain confused. A vital point will have one trail leading up to it and then going on to a logical junction, another road or a house or a settlement. The man in the air, of course, is our chief enemy. The hills and valleys which hide opposing armies from each other at ground level mean nothing to the airman. To him our place and position are laid out as on a platter. For him we must practice mass confusion and concealment. It must always be remembered that no part of a country can easily be made safe from his eyes, his camera and his bombs.

Therefore, if we do not know how we look to an airman, we cannot well go about trying to deceive him. He can see us and the marks we make in all lights and at all angles. His photographs can be studied at leisure and with instruments so exact that a stereoscopic reading of a good pair of vertical photos would betray the presence of artificial overhead cover that can easily cheat the naked eye.

Flat-top camouflage cover makes this P-40 practically invisible from the air.

Suppose the enemy has photographed and detected a camouflaged position. What can he do about it?

Grant that he has a pinpoint map reference and a photograph of the target. Still, with all this information, he must detect his target with his eyes before he can even start preparation for bombing. What does that mean in the case of a ship at 10,000 feet flying at, say 250 miles an hour? It takes seconds from the time he thinks he has identified the target until the moment he is certain he has identified it. It takes more seconds from the moment he is certain of the target until the moment when he has made his calculations, set the course, adjusted his bombsights and pressed the button. And the bomb itself in its travel to earth moves forward a certain distance in hundreds of yards. All this time the ship has been going at 250 miles an hour. Therefore, to be sure of unloading his bombs on or near his target, the airman must correctly identify the target while he is somewhere between 3½ to 5 miles away from it.

There has never been any contention that camouflage will in any way avoid attack on a position where objectives are known to exist by the enemy. But in such a case it does lessen the chance of precision bombing and, as a result, may assist in keeping an important work in action.

There is also this to remember: A well-camouflaged position is less likely to be photographed in the first place. Air observers, being human, are unable to concentrate keenly for long periods of time. In

general, they see those things which are easy to see and miss those which require an effort. Thus the most conspicuous things are those most often spotted by reconnaissance aircraft and consequently are the most photographed.

It is to be concluded, therefore, that weapons which camouflage must fight are the eye of the observer and the lens of the camera.

Camouflage should blend as nearly as possible with the colors of the surrounding position. However, it has been established —and there can be no question of this conclusion—that an observer at some thousands of feet is aware of an object by its lightness or darkness and not by its color.

It is of value, therefore, to know what makes objects light or dark. Color, of course, is partly responsible. Other things being equal, the brown loam of a freshly plowed field will look and photograph darker than the pale green of young sprouts. But if you take two surfaces of the same color, the factor which determines how light or how dark they look is their texture. Texture is the degree of smoothness or roughness of a surface and its consequent ability to cast a shadow on itself or its surroundings.

Take a surface that is perfectly smooth of any given color, say, green. The rays of light which strike it are bounced off in parallel rays, like tennis balls from a concrete court. A high proportion of those rays enters the eye of our camera and an effect of lightness is produced.

Take another surface of exactly the same color, lighted in exactly the same way. Only this time it is an uneven, corrugated surface. The rays are bounced off at all angles, like tennis balls from a sheet of corrugated iron. A lower proportion of rays reaches the eye or lens and an effect of relative darkness is produced.

TAKE a third surface of the same color, lighted the same. This time the surface is a nap or texture, like grass or strands of burlap, each strand capable of throwing a shadow. Looking straight down, the airman sees all the shadows, whereas the man on the ground may not. The surface may look light at ground level but to the airman the napped or textured surface produces an effect of relatively great darkness.

Water is an exception to this rule. For a variety of reasons, depending upon local conditions, water may look and photograph blinding white or inky black.

This fact, too, should constantly be kept in mind: Seen from the air in full sunshine a natural shadow is almost invariably the darkest thing on earth. In addition, it is a good working rule to accept that, whereas black paint will often look and photograph surprisingly light in tone, a real shadow always looks almost black.

All AAF personnel should know and practice the art of concealment to baffle the enemy.

A clear understanding of the importance of texture is indispensable to successful concealment in the field.

At March Field, California, the Army Air Forces now has in operation a school (formerly at Hamilton Field) which concentrates primarily on the problems which face the advanced units of the Air Forces. Hundreds of officers have already been graduated and other hundreds are now in training. These men are being assigned with combat units as camouflage officers; they will impress the personnel with whom they come in contact with the need and desirability of total cooperation in camouflage.

(Continued on next page)

Camouflage For The Army Air Forces

BY BRIGADIER GENERAL S. C. GODFREY, U. S. A., AIR ENGINEER

THE Army Air Forces is becoming increasingly camouflage-conscious.

In our peacetime training and maneuvers, such things as dispersion, concealment and camouflage receive too little attention. They involve trouble and inconvenience, take time, require materials and add to the cost. It is much like digging trenches. Our Army doesn't do much trench digging in peacetime maneuvers but in war men dig in, and dig in furiously, rather than be killed.

So on the battlefield we sometimes learn—the hard way—that planes and facilities on an airdrome must be dispersed to minimize costly losses; that concealment is a most potent means of protection; that even an elementary knowledge of camouflage may save lives; that all these procedures are not merely defensive measures but have to do with deceiving the enemy and adding to our offensive power. It is well if we can learn these things before going into battle.

Camouflage is everybody's job. The Corps of Engineers is charged with the development of camouflage technique, the preparation of camouflage literature, the procurement of camouflage supplies, and assistance in training and practice of camouflage. Engineers in all echelons can assist with their technical knowledge and can do a certain amount of actual construction—but the practice of camouflage and camouflage discipline is the task of each unit, not just a specialist's job. The success in implementing a program of training and use must depend upon the interest of commanding officers and their vigorous action to assure attention to this subject.

There are many evidences of growing interest and proficiency in camouflage in the Army Air Forces. Our Camouflage School at March Field (which is integrated with the Camouflage School at Fort Belvoir, under the Chief of Engineers) has now graduated hundreds of Army Air Forces officers of all ranks who have learned something of sound technique during two weeks of intensive courses. In each Air Force mobile school units have been organized to carry instructions to non-commissioned officers at home stations. Camouflage instruction is being included in most of the training activities of the Army Air Forces, including operational training. The Fighter Command School, at Orlando, has given it much attention, and full provision is being made for it in the plans for the Army Air Forces School of Applied Tactics. Air Service groups, with engineer assistance, have operated this past year from camouflaged bivouacs. Dummy airfields and dummy towns are in the picture. We now have two well-trained camouflage battalions, prepared to contribute to effective training at home or to serve overseas.

Some of these recent camouflage training activities are well described and pictured in Aviation Engineer Notes No. 10, prepared and published by this office in the Directorate of Base Services, and distributed to all Army Air Forces activities. These present a detailed picture and reflect the spirit, enthusiasm and effectiveness of some of these training activities.

Still more valuable will be the presentation, from time to time, of pictures of camouflage activities overseas. These come, as a rule, in fragmentary form, with here and there a striking example of how the skillful use of some local materials has aided effectively in concealment. An Engineer soldier who had helped to camouflage some anti-aircraft batteries in Hawaii was wounded and returned to the United States after December 7, 1941. It was his proud remark that "they hit our dummy guns, but they didn't hit the real ones!"

It is not my purpose to write here a technical article on camouflage. But I am interested that one of the staff of AIR FORCE, after visiting our Camouflage School, has prepared an article on camouflage and its importance as it appears to him. It is a good basic treatment of the subject, and should be of interest to many readers.

CAMOUFLAGE IS A MUST!

(Continued from Preceding Page)

On the east coast a similar course is given by the Chief of Engineers at Fort Belvoir, Virginia, for officers of both Air and Ground Forces.

The basic purpose of the instruction at Hamilton Field is to teach the men to use that uncommon attribute—common sense.

The course naturally includes all the fundamentals of camouflage, materials, organization, interpretation, requirements and so on. They are immediately indoctrinated with a principle which might well be applied to all branches: If a camouflage idea prevents the effective tactical use of a weapon or position, modify the camouflage idea. If an effective camouflage idea interferes with the administrational layout, change the administrational layout.

These men are put to work garnishing fish nets, the weaving of mats and screens. They are taught the operation of paint shops and the use of scrim, the draping of nets, the use of adhesives. They are taught the facts of dispersion, the uses to which everything from chicken feathers to local grasses can be put. The principal emphasis always is placed on how to use quickly and effectively the materials at hand.

Also—and this is certainly as important as anything else—they are shown the necessity of camouflage discipline.

As said before—and it cannot be too strongly emphasized—no matter how well concealed an object may be, its position will be instantly apparent if there are tracks and paths leading up to it and packed down areas around it. Thus, one of the most important functions for the camouflage officer is to see that the approaches to his objective do not have an extraordinary appearance. He must see that no impedimenta is ever out from cover or shadow. Standing grass, as pointed out, looks dark to the airman because he sees the shadow cast by each blade. When some of those blades of grass are laid flat by the feet of men or by rolling wheels or any other cause they cease to throw shadows and become smooth reflecting surfaces facing the sky. Therefore, they look and photograph light. Few people realize with what certainty this effect is produced. They think that one or two journeys across the grass on foot or with a truck cannot make all that difference.

It cannot be over-emphasized that the one camouflage effect to which everyone from cook to pilot must contribute is discipline.

Finally, of course, the object of the school is to indoctrinate Air Force personnel with the constant necessity of camouflage, to make clear that concealment is not hiding for hiding's sake. It is hiding in order to attack the enemy with more deadly effect.

Camouflage is just as surely an offensive operation as it is a defensive. There is no attack without materiel. ☆

Camouflage DO'S and DONT'S

DO choose your position carefully. A proper "estimate of the situation" will make your work easier and avoid impossible camouflage problems.

DO avoid the skyline when concealing against observation from the ground.

DO make full use of natural cover. Utilize ditches, hedges, edges of woods, folds in the ground, etc.

DO avoid conspicuous landmarks. You don't want to be at a focal point of enemy attention.

DO keep in the shadow. The enemy can't see or take pictures in the shade.

DO remember that shadows move. Although shadows as a rule fall toward the North, their length and direction change throughout the day.

DO avoid regularities of line or spacing. Nature has no straight lines and the enemy is looking for unnatural signs.

DO garnish carefully. Natural garnishing must look NATURAL, so use material similar to that in the vicinity and support it as it would grow.

DO thin out garnishing at the edges. A regularly garnished net casts a regular shadow which is obviously out of place in the surroundings.

DO change dead vegetation. Forget and something (or somebody) will be dead.

DO keep turf or topsoil when digging in; use it to cover your spoil on the parapet.

DO make Bold pattern, in garnishing or painting. You can't see a two foot "break" in the outline from a distance of a mile.

DO "look before you leap." Plan and lay out your position in detail before moving in and trampling down promiscuously.

DO observe camouflage discipline in making a reconnaissance. Signs of activity before occupation are just as disastrous as signs afterward.

DO restrict movement when the enemy is observing. A moving object may attract attention.

DO take extra care when tired. Fatigue leads to carelessness.

DO work in the shade or at night. The enemy is looking for you at all times but his eyes are not as good as a cat. He can't hit what he can't see.

DO keep your flat tops "Flat." Sagging nets are worse than baggy knees.

DO use existing roads. Traffic here will not leave noticeable signs.

DON'T be careless and give away your buddies. They're depending on you just as you are on them.

DON'T look up at airplanes. The enemy is looking for you too and you're easier to hit than he is.

DON'T move unless you have to; then think first how you can move to cover most unobtrusively.

DON'T use artificial materials unless the natural cover is insufficient. Natural cover blends best with Nature.

DON'T be regular in your layout. Regularity is a military attribute and the enemy recognizes it as such.

DON'T take shortcuts over the open or step outside cover. Every time you put your foot down you attract forty-eight square inches of enemy attention.

DON'T walk around the outside of a net to fix the camouflage. Where you walk will be light in a photograph; the camouflage will be dark.

DON'T hide your installation and leave your spoil and belongings in the open. Remember the Ostrich.

DON'T let your flat tops sag. They will photograph like a wet blanket laid out on brushes and they are not a bit safer.

DON'T lower the sides of your camouflage. Your Commanding Officer cannot see what you are doing, but when the enemy sees the shadow thrown by those sides he will be even more severe.

DON'T hide under matted camouflage. It is as conspicuous as a bad haircut.

DON'T end a road at an installation or make a lot of trails to a position. Have you ever lost your way to a Canteen?

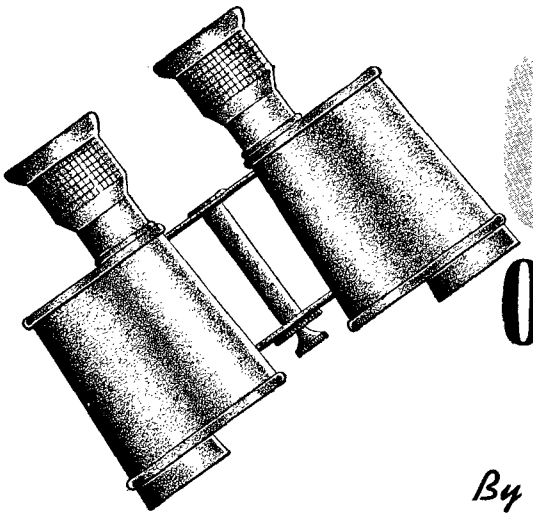
DON'T leave things near the edge of your camouflage. The edge of your camouflage isn't—and shouldn't be—opaque.

DON'T put up bad camouflage and think it's a magic veil. There aren't any in war.

DON'T crowd around an installation. Dispersion reduces the likelihood of conspicuous trampling.

DON'T clean up old position; it won't look natural to the enemy. If you're moving out, it will remain as a dummy; if you're moving in you don't want to change the appearance.

DON'T expose lights or make a great deal of smoke. The enemy is looking for such beacons.



Observations ON THE RUSSIAN FRONT

By Major John C. Henry

AIR TRANSPORT COMMAND

A description of the Soviet offensive by a member of the first group of foreign observers to witness combat operations in Russia.

THREE American Army officers have been the first foreign observers to witness actual combat operations of the Soviet Army.

The group, headed by Brigadier General Patrick Hurley, former Secretary of War, visited the desperately contested Don-Stalingrad front early in December, traveling close behind a fast-moving Red Army as it sliced its way southward. Later, the same official group went into the Caucasus to another sector of this gigantic winter offensive operation.

Lieutenant Colonel Richard Park, Jr., assistant U. S. Military Attache at Moscow, was the second member of the American party. I was the third. General Hurley, visiting Moscow on a special assignment for President Roosevelt, arranged the trip to the fronts during a conference with Premier Stalin at the Kremlin.

For the actual entry into Soviet air, the Russian government added to our American crew a navigator and radio operator from their own Air Corps—essential assistance for the jump over the rugged Elburz Mountains and across the Caspian into territory where foreign planes without certain identification are shot down first and questions asked second.

And when it came time for us to leave Moscow for the journey into combat areas, we transferred into a Russian-built plane piloted by a 27-year-old Captain wearing two Red Army decorations for bomber and parachute service earlier in the war. Around us throughout our travels in the combat zones were fighter escorts, usually eight in number, and our altitude seldom exceeded 300 feet. More often it was 100 feet as we hedge-hopped over houses, hay-stacks and great forests of white birches that break the snow-covered steppes.

Neither section of our trip up to the fighting lines was a sight-seeing expedition; they were military reconnaissances in which every pertinent fact was laid out by the commanding generals of a great offensive operation for the critical scrutiny of the officers of an allied army. The cooperation in this respect could not have been more complete if we had been observers with our own forces.

The campaign which we reviewed in the Stalingrad sector was painstakingly planned. Tactics which had worked well for the enemy were reviewed and transposed with modifications or improvements into the Soviet battle plan. Great dumps of supplies were established at the safest convenient points.

Every facility for transport of the day to day needs of an attacking army was pressed into service — aircraft, railroads, motor trucks, oxcarts and even sleighs. Manpower was assembled in generous quantities and the responsibility for leadership and execution placed in the hands of young officers whose knowledge of war had been gained in the field since June 1941.

For obvious reasons much that we saw and heard in this campaign must not be told publicly at this time. On the other hand, previous Soviet policy of permitting no foreign observers, either Allied or Neutral, has created great mystery around actual front line operations of the Red Army. The lifting of this veil in the case of the Don-Stalingrad offensive was a substantial gesture toward more complete American-Soviet cooperation and coordination of effort.

Briefly, the Soviet battle plan called for the drive of a spearhead army due southward from Serafimovich on the bank of the Don with a pivot at Kletzkaya and further advance southeastward to another crossing of the winding river. In the vicinity of the railroad line between Stalingrad and Kalach, junction was to be effected with two armies that had started westward from just south of Stalingrad and wheeled in a northerly direction for the closing of the pincers.

Protecting the spearhead army from the north was another army on its west flank, employing the River Chir as its front against the Axis forces, and still another army on the east flank with the task of cleaning out all enemy forces within the Don elbow between Kletzkaya and Peskovatka.

Almost to the mile and to the minute this program was carried out. Although preliminary operations early in November had established the spearhead army at a good starting point between Serafimovich and Kletzkaya, the real push took place in a crowded four days late in the month.

When this 96-hour span was completed the toughest fighting division of the spearhead army had joined hands almost due west of Stalingrad with units from the two southern armies, the clean-up job inside the Don elbow had been done with merciless efficiency, the western flank seemed securely covered at the Chir, and roughly a score of enemy divisions were encircled between the Don and Volga Rivers.

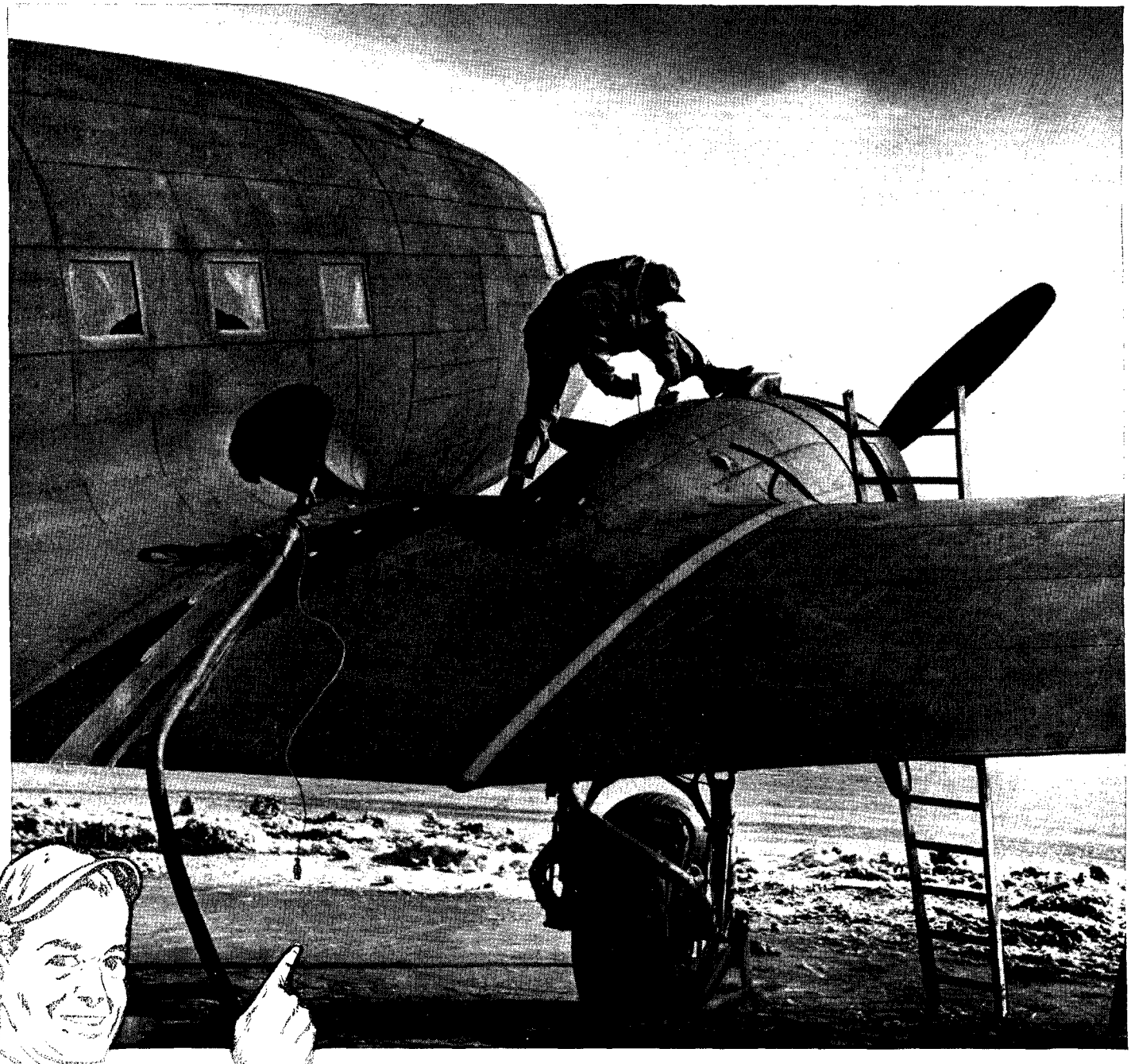
Because of unfavorable flying weather, air strength had played a very small part in this offensive operation and we saw relatively little air action during our travels on either front.

It was emphasized, however, that Soviet air reconnaissance had done a magnificent job in supplying photographs and detailed information on enemy positions to the Red ground troops. At Kletzkaya, we were told that the Russian artillery knew the position of every Axis gun on the Don river heights and that the benefits of this knowledge were evident in the quick rout of the enemy batteries.

Conversely, the Soviet commanders told us that the surprise element had been complete in the preparation and launching of their offensive—largely because their fighters had driven off virtually every Axis reconnaissance plane before it could complete its mission. We saw numerous instances of this alertness by the Red fliers as they patrolled the skies over the combat sector.

Apparently outnumbered and aware of it, the Axis air force showed itself hardly at all except for somewhat desperate attempts to move supplies across the Russian ring into the area held by the encircled axis divisions. Several times we saw flights of Junkers transports (Continued on Page 37)

ON THE LINE



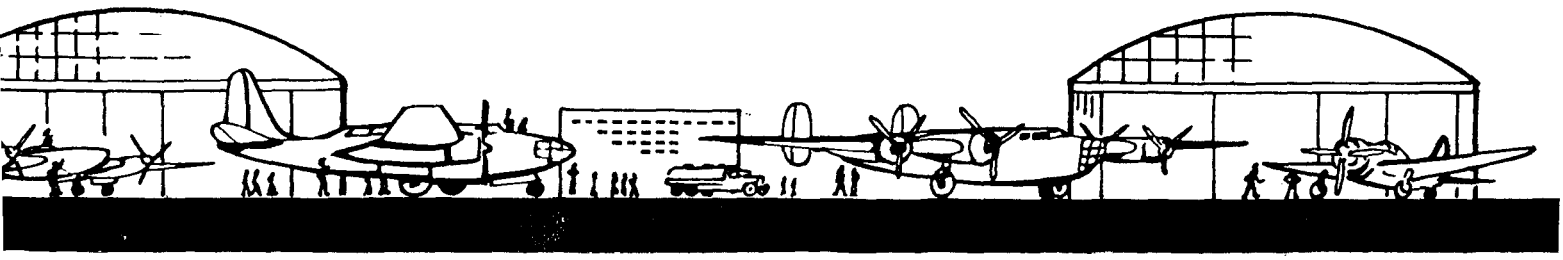
WHAT'S WRONG WITH THIS PICTURE?

Well, several things; eight to be exact. Or did we miss something?

Tech Sergeant Fred Kohlman and Sergeant Clarence Shwake suggested the boners pictured above. Staff Sergeant Francis Seitz posed *how not to do it.* All three are in Headquarters Squadron, Air Service Command, Patterson Field, Ohio.

"Our Mechs in the Army Air Forces are the best in the world," says Crew Chief Seitz, "but a few of the boys sometimes forget what they're taught—or are so busy they just get careless. You can spot the careless ones by their work and their results. Just watch!"

We did. What's wrong? Answers are on the opposite page.



A monthly roundup and exchange of hints and tips for mechs—some old, some new—in the interest of better maintenance.

DID YOU KNOW...

That Technical Orders should always be made easily available to the men of the air and ground crews whose duties require constant use and reference to them. See T. O. No. 00-25-3.

That the word RESTRICTED on Technical Orders does not restrict men on the line from reading and studying them daily. Rather, it means that because of the material contained, Technical Orders come under the classification of Restricted documents as defined in AR 380-5, and are for official use only. Use your T. O.s—but don't talk about them to unauthorized persons.

That the maintenance Inspection Record, Form 41B, is now provided with a pocket in which AAF Forms 60A, 60B and 61 will be carried. See T. O. 00-20A, Sect. 1, Para. *d*.

Thanks to Technical Sergeant E. R. Morris of Mitchel Field, New York, who sent in the following reminders:

TAGGING...

When disassembling airplane assemblies, engines or accessories, it's a good idea to tag each part when you take it off. This makes immediate identification easy and speeds up the job when replacing the parts.

CARBURETORS...

When removing carburetors, be sure to close the butterflies. Safetying them shut before removing the bolts prevents dropping nuts, bolts, washers and bits of safety wire into the blower.

DRIP PAN RACKS...

Vigilant care in keeping drip pans under airplanes while work is being performed, prevents grease and oil from getting on the hangar floor; it makes your job much easier in keeping the hangar clean and safe. One squadron has built a drip pan rack (on the principle of a bicycle stand rack) which holds the pan vertically on their sides. Pans are put on the rack immediately after use. This allows the grease and oil to drain down into another pan (which is placed horizontally under the rack) and assures a supply of clean pans at all times. Also, it is easier to withdraw pans from this rack than to bend over and take them from a flat floor stack. The stand, which provides a separate slot for each pan, protects the edges and prevents them from getting bent out of shape.

LOOSE TOOLS...

A fighter pilot while recently doing a slow roll at 20,000 feet suddenly felt a sharp blow on his shin bone. Looking up, or rather down, for he was now upside down, he saw a large wrench sliding around the cockpit enclosure. The roll was completed — but cautiously — to keep the ominous wrench from hitting him again. Moral: Don't leave wrenches in the cockpit. Carrying your tools in a kit, rather than stuffing them in your pocket will make it easier to check them when each job is finished.

MULTIPLICATION...

About last month's item on not brush painting propellers, an engineering officer points out that an ounce of material on the tip of a propeller blade having a five foot radius ceases to weigh one ounce when centrifugal force is applied. At 1800 R.P.M.'s that ounce is multiplied by 5,536—making it 346 pounds to be exact. That's the reason for excessive engine vibration when paint is dabbed on promiscuously. See T. O. 07-1-1 for complete details on painting of propellers.

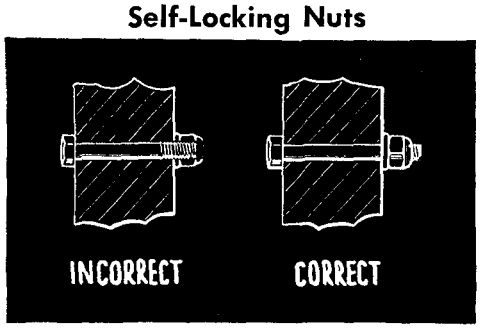
USE A PENCIL...

When marking bolt or stud heads, be sure to use a pencil rather than a file. The heads are finished with cadmium plate; a file scratch will open this protective covering and invite rust.

COTTON PLUGS...

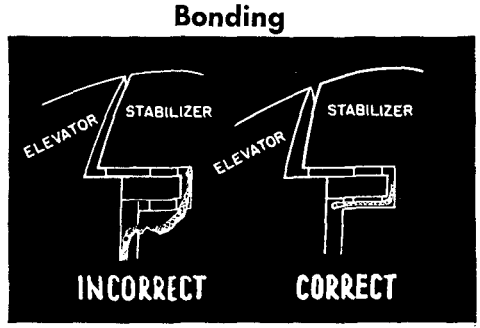
The problem of noise is treated lightly by most members of air crews. Too bad. Exhaustive experiments prove that persons continually subjected to noises of considerable intensity show a slow but steady loss in hearing ability. This leads, in certain cases, to deafness. Ground crew members who are daily in contact with the noise of motors show the same detrimental changes. Flight surgeons recommend the judicious use of cotton ear plugs.

Self-Locking Nuts



INCORRECT: Bolt not completely through self-locking nut.
CORRECT: One to two threads should be showing beyond the nut for proper installation. See T.O. 04-1-13 for general instructions on use of self-locking nuts.

Bonding



INCORRECT: Excessive length will cause flexing, chafing and eventual breaking of the bond.
CORRECT: The bond is of sufficient length to allow full travel of the surface, and the ends are tinned. Broken and frayed bonding must be replaced as specified in T.O. No. 08-5-1.

MISTAKES ON OPPOSITE PAGE
Reading from left to right

1. Wait a minute! You're likely to damage the trailing edge with the service hose; wing tanks should be serviced from the leading edge of the wing. And it's much easier to get the gas truck in front of the airplane. If de-icer boot is attached, protect it from the hose with sufficient padding. Reference: Common sense.
2. The tank is full, too full. Cut off the gas. You're creating another fire hazard. Reference: T.O. 06-5-1 and common sense.
3. And what's that static ground wire doing hanging loose? Quick, ground the hose! Reference: T.O. 06-5-1.
4. You should be holding the hose nozzle with your hand. Never let it hang there by itself; it may break off the filler neck on the tank. This bad practice, on tanks that have no filler necks, will result in damage to the tanks. Reference: T.O. 06-5-1.
5. Hey! No wonder you're having so much trouble; do one job at a time.
6. Get your left foot off the air scoop. Besides damaging the scoop, you're likely to fall off the wing and hurt yourself.
7. Better not use that screw driver to check the oil level. You're liable to drop it into the tank. Use the oil gauge prescribed for the aircraft you're servicing.
8. Why not use the proper crew chief stand instead of a ladder? And the ladder shouldn't be leaned against the leading edge without proper padding. How do we know it isn't padded? Because you've got it upside down. It's not only wrong — but definitely unsafe.

That's what Crew Chief Seitz meant about carelessness.

Using Cardboard in Combat First Aid

By Sergeant Max Baird

March Field, California

The side of a packing box assumes a place of importance in a novel method of handling wounded personnel.

In Alaska not so long ago, a wounded man from a Liberator crew was carried into an Army hospital with a serious back injury—one of the most dangerous injuries of them all when the patient must be carried.

What kept this incident from being run of the mill was that the man was all trussed up in cardboard marked with strange diagrams and lines reading "Cut here for neck and back splint," "Out here for elbow splint," and similar hand-lettered inscriptions. The cardboard itself, however, still showed the origin of its former duty as the side of a packing box. The wounded man arrived in excellent condition, and the doctors gathered round with lifted eyebrows at this unorthodox, but plainly effective, procedure.

For the answer to that startling entrance into the Alaskan hospital we must hop southward some 3,000 miles to March Field, California.

Using a piece of common ordinary cardboard and a triangular cloth, Major Walter J. Crawford, Medical Corps, after more than a year of research and experimentation at March Field has perfected a revolutionary first aid technique which he has found to be the practical answer in battle.

From a section of corrugated cardboard only sixteen inches wide and thirty-two inches long and following the Crawford diagrams, even Joe Yardbird can quickly bind up an excellent elbow, ankle, leg, neck or back splint that will do the job. Coupled with the use of a cravat (No, Joe, not a necktie, just a medical lingo for a triangular cloth 51 inches at the base and 36 inches on each of the other two sides), these two easily provided articles form the basic ingredients for his recipe for a first aid kit that is capable of pressure-bandaging and splinting most injuries.

Major Crawford follows the old adage that one picture is worth ten thousand words. Also, somewhat like the character who operated the shell game at the county fair, he leaves nothing to chance and, like Gypsy Rose Lee, very little to the imagination.

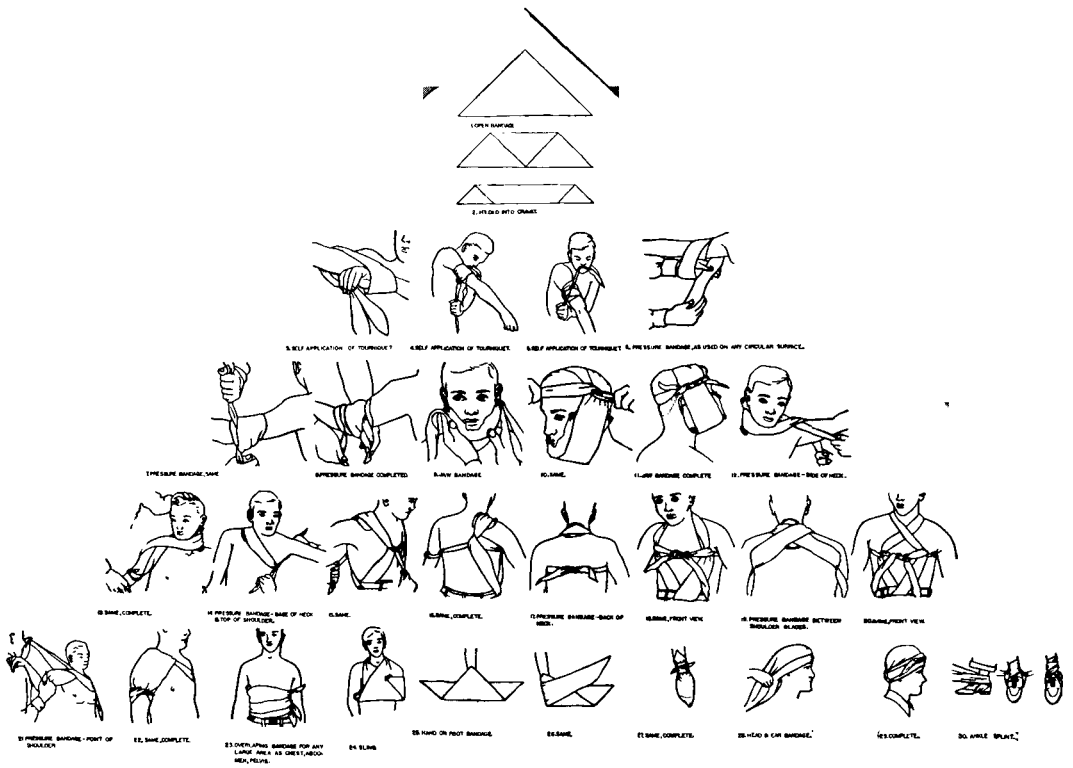
Accordingly, every one of the heavy bombers in his Group takes off equipped with his additions to the standard aeronautical medical kit. These consist of five of his specially designed cardboard splints, three cravats, a tube of Butyn and Metaphen Jelly (for eye injuries and burns), four large safety pins, two poles eight feet long which are used to improvise a litter with flying jackets and one being utilized for the carry through the bomb bay, and, finally, two blankets.

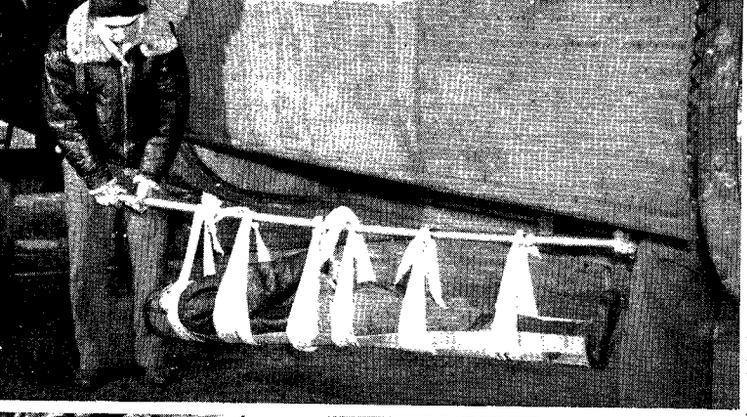
The Crawford cardboard splint is diagrammed with lines and printed directions indicating where to cut to make the required splint for the specific injury. It's as easy as "cutting on the dotted line" to open a box of breakfast cereal. On the lower half of the cardboard are drawings describing how to apply the different splints.

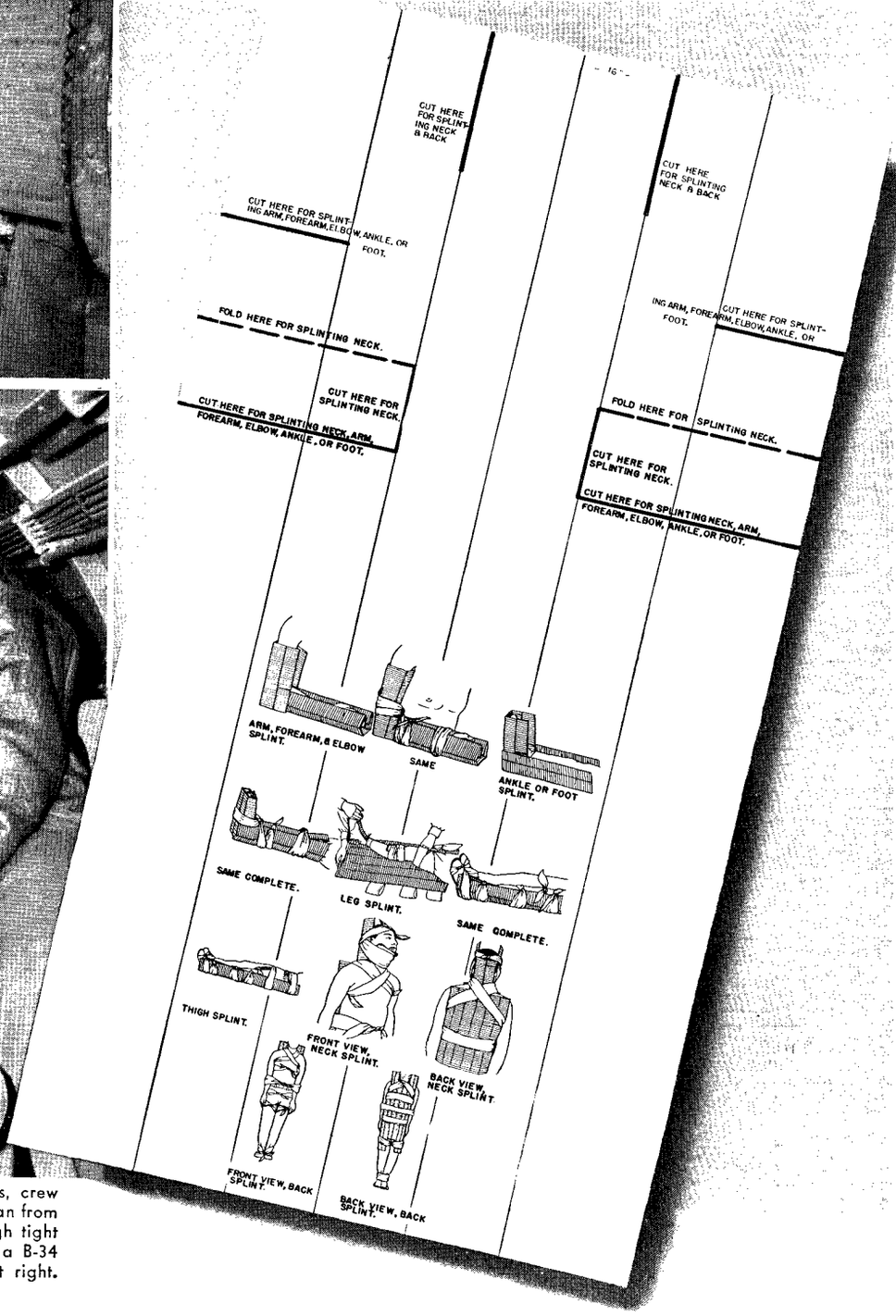
"This splint allows for splinting the elbow and forearm with a folded cardboard layer that provides diffuse, even pressure on the forearm while in a neutral position. The same cuts are made on the cardboard to make the ankle splint," Major Crawford says.

The cravat is also stamped with "profuse illustrations" showing how to use it for self-application of a tourniquet, its use for pressure bandages, and a self-operated pressure bandage for the side of the neck, by which the patient can increase or relax the pressure by lowering or raising his arm. The cravat can be laundered and reused.

On the back of the cardboard are detailed first aid instructions for shock, wounds and hemorrhages, fractures, burns, artificial respiration, and transportation of wounded. Listed also are the contents of the standard aeronautical medical kit and the additional articles carried under the Crawford system, plus the uses for each so that whoever is







Employing the Crawford cardboard splints and cloth cravats, crew members in the upper photo simulate removal of a wounded man from the bomb bay of a B-24. This method permits passage through tight squeezes such as the entrance to the pilot's compartment of a B-34 (lower photo). Front view of one of the splints is shown at right.

applying the first aid can determine at a glance just what he has to work with and what to do with each item. The splints can be (and have been for actual injuries) applied in two or three minutes in contrast to the fifteen or twenty minutes often consumed in using standard splints.

Major Crawford has had remarkable success with the system. "Enlisted men without previous experience have learned to apply all the procedures, pressure-bandages and splints in two hours," he declares.

Since all combat crew members fall within certain sizes he has found that the 16" x 32" dimensions for the cardboard splint "fits" his personnel. For units with men with a wider scale of physical proportions the splint, of course, can be made in correspondingly smaller or larger sizes.

His splints are applied with the clothes left on the patient. Flying at high altitudes wounded men can not be undressed because of the cold. To permit access to the wounded area for bandaging without undressing the patient slits are cut in the flying clothes wherever necessary. In the case of burns he directs that the clothing also be left on because to rip the clothing from a burned area often tears away flesh and accentuates the danger.

Wounded men are removed from the bomber in a manner similar to the pole-carry of two hunters with a dead deer. The cardboard splints, two layers thick if necessary, are used to pad the man's body which is tied with cravats to the eight-foot poles for the carry through the bomb bay. This technique was developed by another flight surgeon, Colonel Clyde L. Brothers, surgeon of the Fourth Air Force, under whose supervision the entire system was worked out.

While most of his technique is original, Major Crawford naturally has called upon previous first aid systems to some extent. The most important contribution was supplied by Dr. Charles F. Sebastian of the Los Angeles Emergency Hospital.

The pressure-bandages which use cross pulls for vertical leverage and the neck and back splints shown are exactly as developed by Dr. Sebastian. The practice of putting a strip of gauze in the head of each safety pin so it can be found and removed quickly with a sharp jerk on the gauze, even in the dark, was also borrowed from Dr. Sebastian who modified it from a trick of British ambulance drivers. Major Crawford added the stunt of having a strip of green gauze to indicate morphine has been administered and red gauze to signify a tourniquet. ☆

Balancing the airman's gripe as a means of overcoming a serious problem in front line flying operations.

A New Aspect of FLYER FATIGUE

By Lieut. Col. David B. Dill

AERO-MEDICAL LABORATORY, WRIGHT FIELD

REPORTS coming from theaters of war have led to a revision of ideas about flyer fatigue. Anoxia has been mistakenly branded the bugbear of pilots as a major cause of pilot fatigue.

This idea now appears to have been an over-simplification that has resulted in much wasted effort in research on "ceiling" and the influences on it of drugs and hormones. Pilots are instructed to use oxygen above 10,000 feet: If they fail to do so and become fatigued because of chronic anoxia the remedy lies, not in pills, but in more thorough education and more comfortable oxygen equipment.

Acute anoxia is a serious problem and will remain so, even if perfect oxygen equipment is developed. In the emergencies of combat, occasional loss of oxygen supply at high altitude is inevitable. Here, too, there are better remedies than pills — improvement in both regular and emergency oxygen equipment and thorough drill in the use of such equipment.

It is now clear that fatigue as it is seen today in combat flyers is no simple state that can be described in terms of cause and effect. Rather, it is produced by the many unpleasant stimuli about which one is accustomed to gripe. So long as the flyer's gripes are balanced by successful missions, by a conviction that he has a role in winning the war, by good and frequent news from home, and by periods of rest and recreation, all is well. If not, all may be lost regardless of remedial measures.

What are these stimuli responsible for flyer fatigue? Some of them are peculiar to war and to the flyer's role in the war; others are essentially the same as those experienced by the wartime worker at home. Examples of the former class are:

Doubt as to whether the engineers and workers at home have given him the best equipment brains and brawn can produce.

Doubt as to whether the mission assigned him has a reasonable chance of success.

Will his gas supply carry him through?

Can he survive a crash landing at sea?

Even if he survives the crash landing, will he be rescued?

Has he and has each crew member done everything humanly possible to make the mission a success?

Will there be impartial recognition of his exploits? Or, will quitters be sent back to safe jobs and to superior ratings?

Some sources of irritation are as common among industrial workers as they are among flyers. Noise, vibration and glare may be as wearing in a factory as in an airplane. However, no job in industry can compare with that of the side or tail gunner in our heavy bombardment aircraft. It is doubtful if there is a tougher job in this man's army than that of the soldier manning a machine gun in a —40 air blast at the open port of a B-17 as the plane is being "horsed around" in evasive tactics at altitudes of 30,000 feet and above.

Relations with one's immediate associates and with superiors in rank may be a source of satisfaction and of inspiration or of discontent and discouragement, whether in industry or in a combat squadron. Strong bonds become established between officers and men who have spent hundreds of hours in successful combat and in long-range flights far above land and sea. Such bonds help to carry men through periods of stress where training, self-sacrifice and team work are at a premium.

HOME conditions may add to or subtract from morale, whether the son is in a distant wartime factory or in far-off New Guinea. Dirt and disease may afflict not only the soldier but also the wartime worker far removed from home comforts. In fact, the soldier may well have better medical care than the civilian.

If irritants are too numerous and too distressing, fatigue results. The flyer does not rest well at night; his sleep is fitful and broken with nightmares. He awakens physically worn and mentally depressed. His spirit lags. He may fail in a mission easily accomplished by a fit and spirited flyer.

The wise commanding officer will heed the advice of his flight surgeon and by enforcement of simple principles will delay or even completely forestall the development of fatigue in the officers and men of his command. These principles are:

Provide friendly, encouraging leadership.

Insure impartial distribution of citations.

Provide the most attractive and comfortable quarters that the exigencies of war permit.

Provide the best food obtainable.

Provide medical care that is competent, kindly and sympathetic.

Provide opportunities for rest, for recreation and for sports with rapid evacuation of non-effectives to their homes.

Relieve combat crews after 100 to 125 hours of combat operational flying.

Relieve members of combat crews who show definite indications of approaching the war-weary stage.

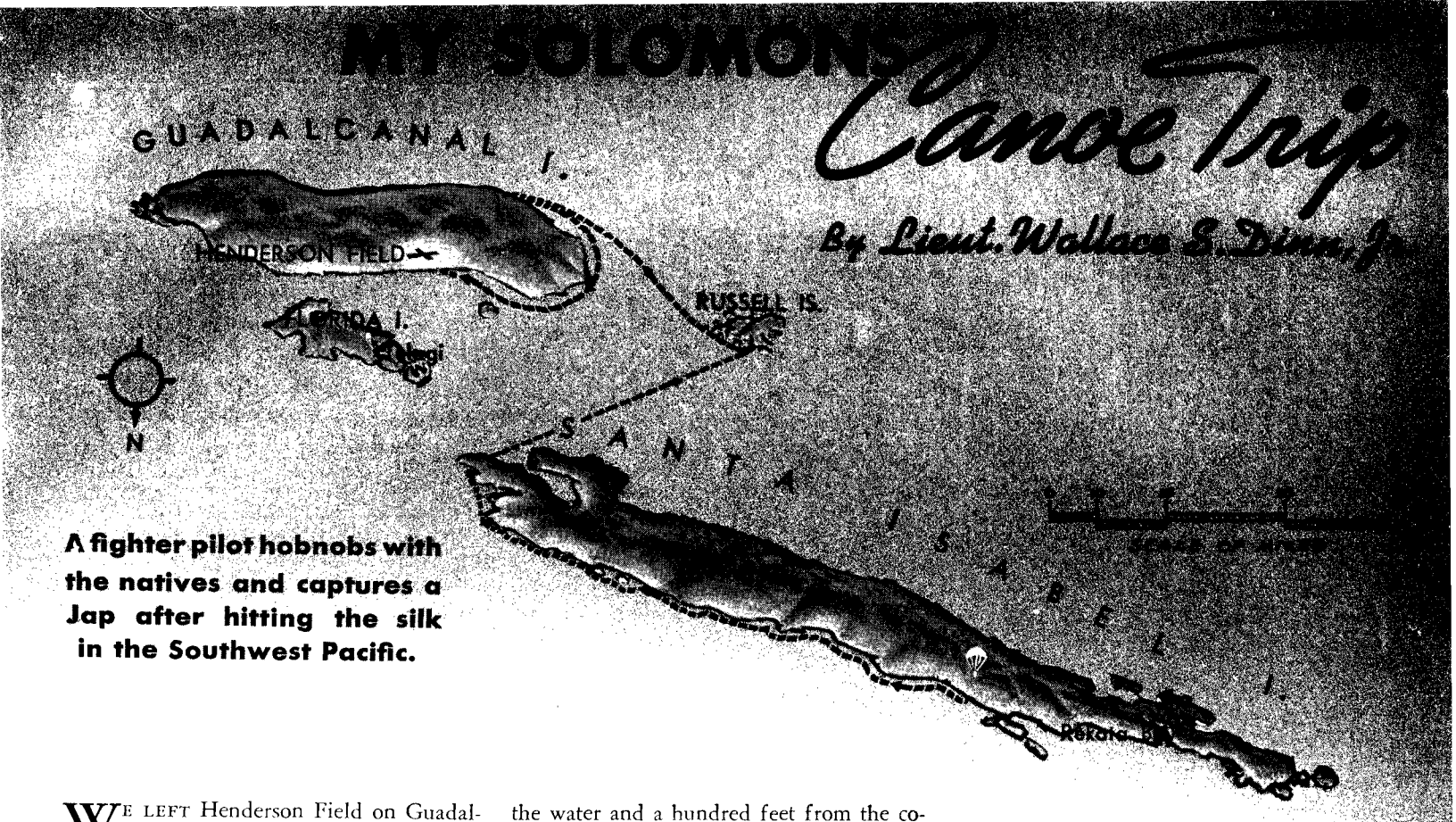
Most of these principles are so well recognized and so generally practiced that no emphasis is necessary. One, however, which has been neglected is the need for providing active participation in sports. Every squadron has an operations officer, an engineering officer and an oxygen officer. There also should be an athletics officer given the responsibility of obtaining sports equipment and facilities for organizing teams and for directing a sports program. Such a program not only would sustain morale but would make flyers more efficient. The man who is tough has the best chance of survival in an emergency, whether in a life raft, in a jungle or on a Greenland ice cap. Such a program of athletics has all the support from higher authority that is needed. This is found in AAF Regulation 50-14, dated August 15, 1942—one paragraph of which Regulation is so clear-cut and emphatic it is quoted here:

> "7-*d*-3. Special emphasis will be placed on a physical training program for conditioning and the maintenance of proper condition of flying officer personnel. All such personnel below the rank of Colonel will participate in a minimum of five hours per week, distributed over a period of not less than three days per week, and when practicable as determined by the commanding officer, this time allotment will be regularly scheduled one hour per day six days per week."

One of the most powerful counter-irritants for offsetting fatigue comes in the form of good news from home. Letters, pictures, magazines, go far towards sustaining the soldier's morale. The full solution for this problem is not in the hands of the commanding officer: He depends on the folks at home to solve it for him by writing often and by sending pictures, home-town news, and newspapers. ☆

MY SOLOMONS Canoe Trip

By Lieut. Wallace S. Dinn, Jr.



A fighter pilot hobnobs with the natives and captures a Jap after hitting the silk in the Southwest Pacific.

WE LEFT Henderson Field on Guadalcanal about seven o'clock on the morning of October 28 to attack the Japanese seaplane base at Rekata Bay, Santa Isabel Island, some 165 miles away. On the mission were four Navy SBDs, six Grummans and three P-39s.

Captain John W. Mitchell was leading Lieutenant Jacobson and me in the P-39s. Our mission was to fly cover for the SBDs, divebomb, strafe and, with the Grummans flown by Marines, cover the return of the SBDs.

There was an overcast ceiling at 2,500 feet, so we made our diving approach above the clouds. The SBDs dropped first and headed back. We dived immediately behind them with the Marine fighters.

After dropping our bombs, we proceeded to strafe the enemy floatplanes on the water and blast a few ground installations. Eight enemy planes were reported destroyed, but I saw only six of them get it. We experienced no enemy fire during several runs.

When we were pulling off the target for home, I spotted an enemy gasoline dump of about 1,500 gallons well-camouflaged on the beach. I called Captain Mitchell's attention to my discovery and he told me to return and strafe the dump if I had any ammunition left. My two right .30 caliber wing guns were still firing so I went down.

The first burst set a small blaze at one end of the dump. I pulled up and started down on the other end. As I dived I strafed the beach and got in an extra burst at the already damaged floatplanes.

I had to fly along sideways to keep the two live guns on the gasoline dump, and as I pulled up this time, I heard a close explosion and my right side went numb. This happened when I was about thirty feet off the water and a hundred feet from the cocoanut trees along the shore. Smoke began filling my cockpit and I saw Prestone running in from the right side. Since I could move my arm without difficulty I figured I wasn't hit badly, if at all.

Immediately I chandelled left, away from the enemy. Smoke was boiling into the cockpit and my breathing was becoming increasingly difficult. The Prestone gauge was against the stop and the oil was heating up like the devil. I tried to call Captain Mitchell on the radio to give him my position because I knew I would have to bail out soon. I couldn't see any of our planes. When I received no answer, I knew my radio set had been disabled.

MY burning ship struggled up to about 2,000 feet and I spotted two Marine fighters in front of me. I fired tracers in front of them to attract attention and immediately they turned. One chap, named Watkins, seeing me smoking, pulled up alongside.

My engine was pounding like hell and giving little power. Since it was low tide and there was a wide expanse of white sand down below, I started to crash-land but thought the better of it when I realized how near I was to the Jap seaplane base. So I figured I'd have a better chance of getting away if I bailed out.

I pulled the emergency door release, waved to Watkins and went over the side. I seemed to fall in a sort of forward position without tumbling. There was no sensation of falling. Probably I was too excited to notice.

Suddenly I realized there was something else I should do—I pulled the ripcord. The ground was now coming up at an alarming rate and I began wondering how I would land. It was all over in a moment. I came down with a bit of a thud in a little clearing at the foot of a tree in which my chute had tangled. I cut my jungle pack free from my chute, cocked my .45 and started down the hillside.

ILLUSTRATED BY
PAUL REED

The jungle was so thick I had a tough time making the beach although it was less than a mile away. I decided to visit a village I had seen from the air and began sneaking along the edge of the beach. The Japs were between five and ten miles away, I figured.

I was moving along trying to make as little noise as possible when an old native popped out of the bush ahead, squawked and ran. I followed him as best I could and he led me to a little village of five huts. No one was around.

A native finally came forward, after I had waited anxiously on the edge of the bush for some time, and asked if I were Japanese. I replied: "American," and he came forward, calling out the rest of the villagers.

After I told them I was a birdman, there was nothing too good for me.

One of the young men of the village, named Eric, could speak pidgin English, having attended a settlement mission school for three years. We hit it off in fine style.

It didn't take long to persuade Eric and several other natives to start with me in a small dugout canoe down the coast of Santa Isabel toward Tulagi, some 160 miles away. The first night out we stayed in the village

of the headman of all the natives on Santa Isabel, a chap named Baku. There was the usual round of shaking hands with the entire population of the village. This I did from a position of importance on something of a throne set up on Baku's front porch.

After a dinner of taro (a Polynesian food plant similar to our elephant's-ear), pineapple and a vegetable that tasted like a yam, the chief - - using Eric as an interpreter — asked about the war. In simple words I told the chief and the assembled natives of the United States and England, of Germany and Japan. The natives were greatly interested. In fact, my talk was repeated at least once a day as we continued the journey later and stopped for food at other villages.

BAKU furnished a twenty-foot war canoe and four paddlers, including Eric, and we started out before dawn of the following day. Paddling steadily, we traveled down lovely canals, broad lagoons filled with multi-colored fish and outside the reef into open water. Now and then Japanese reconnaissance planes would fly over and I would duck to the bottom of the canoe. The paddlers would cover me over with matting. This happened several times during the day. The natives would keep me advised whenever we neared a Jap-controlled island.

We were paddling at a rate of about three miles an hour and the first day out we must have stayed on the job for fifteen hours. Since the rainy season had begun we were soaked most of the time.

To pass the time, I taught the boys the tune to "You Are My Sunshine" and they seemed to get a great delight out of humming as I sang the words. (You should hear my voice!) We also sang "Jesus Loves Me," they carrying the lyrics most of the time in their native tongue. "Jesus Loves Me" was their favorite song — you might say, Number One on the Solomons Hit Parade. I learned the natives had been Christianized since 1914.

Several times during the day, we spotted crocodiles lying on logs along the shore and ahead of us in the channel. I fired at several to frighten them away. I had the only firearm in the party, the natives carrying only crude knives and fish spears.

We spent the night of October 29 on the beach and got an early start the next morning. Crocodiles and fish were everywhere. The natives told me two Japs had been in this locale several weeks before but the crocs had eaten them before the natives could assist them back to Rekata Bay.

At noon we spotted more natives on the beach and they told us of a Jap pilot on a little island about fifteen miles away. His Zero had been hit by one of our guns during an attack on Guadalcanal, but he had managed to keep his ship up for about 140 miles before coming down in the water near this island. He now was attempting to get the natives to escort him to Rekata Bay. We decided to capture him.

That night we paddled to another island about half a mile away from the one on which the Jap was located and made plans to go after him the next morning. The Jap's island was very small and there was no cover. The only natives on it were four men, five women and several children.

Since he was reported armed with a pistol, we decided the best way to capture him would be to sneak over the next morning before breakfast and have three of the boys go on ahead just about the time he would be eating, with the other boy and myself following a few minutes later to help out if there should be any trouble.

The three who went ahead were instructed to grab him and his pistol when he placed it on the table to eat. They were successful, and by the time we arrived on the scene about three minutes later, the Jap was in the process of being trussed up. He immediately begged - - or rather demanded — that I shoot him. And what's more he seemed to think me a weakling when I refused. He asked me why not and I told him he was going back and dig graves for other Japs killed on Guadalcanal.

We returned to the canoe and headed out again. I tied the Jap's hands with wet rope but didn't tie his feet since it was most uncomfortable in the small canoe.

That night we slept in the rain, if you can call it sleep. The native boys watched our prisoner until midnight and I watched him until dawn.

The next day we pushed on hard trying to make a little better time. And we did despite a heavy rain during the early afternoon. We had the evening meal on the beach before dark since we intended traveling late that night.

During the meal I chatted a bit with the Jap and began to feel a little sorry for him. In fact, gave him my last two cigarettes. He was soon to repay me - - but not in kind.

About eight o'clock we began threading our way out through the reef in a driving rain and everyone was busy trying to keep the canoe upright until we reached smoother water—that is, everyone except the Jap. He suddenly tipped us over.

WE lost him as we scrambled for the shore about two hundred feet away. As soon as we made it to the beach, we gathered up our gear and began searching the jungle for our prisoner. After searching in vain for some time, I took one boy and set out for a village nearby, leaving the others to continue the search. They caught the Jap about three o'clock the next afternoon.

I decided right then to weaken him to a point where he wouldn't feel up to repeating his performance. We were faced with a sixty-mile paddle across open water from Santa Isabel Island to Florida Island and Tulagi, and I didn't like the prospect of his turning us over out there. The prisoner was put on a ration of one banana and a little sugar cane a day.

We stayed in the village that night and I learned some Japs were on a little island about two miles away. We became more cautious. The natives, meanwhile, had told me of a coast-watcher with a radio set located some distance down the beach so I decided to take a chance and send a messenger down with a note to be sent to the Marine C. O. at Tulagi. The message read: "Safe here with prisoner. Request orders."

The messenger returned early the next morning (November 2) with the disappointing word that the radio set was out of order, and we made plans to travel across the open sea by canoe. We obtained the largest canoe available, a regular war craft about thirty feet long, with high-pointed bow and stern. I was given nine paddlers for the voyage. The natives figured it would take nearly thirty hours to cover the distance, so we planned to paddle to the tip of Santa Isabel that day, rest for a couple of hours and set out for Florida Island at night when the water would be fairly calm.

We reached the tip of the island by four o'clock in the afternoon and were having a bite to eat when a messenger came running up with word that a British boat was on the other side of the island. He said we could reach the boat - - which would take us to Guadalcanal — in about an hour and a half by crossing the 2,000-foot mountain range which constitutes the backbone of Santa Isabel.

I WAS getting very weak by this time and as a result it took us almost three hours to negotiate the distance. Time after time, I had to stop and rest.

The Jap prisoner at first refused to walk at all. One of the boys had an old bayonet which I figured would provide the impetus for our obstinate traveler. The boy jabbed "Tojo" not too gently and the Nip let out a little yip. Just then three large white orchids fell from a tremendous tree under which we were standing at the moment. Mighty incongruous things happen out here.

We finally made it across the ridge and reached the beach, where we were able to obtain a small canoe in which we paddled about five miles along the shore to the British boat. This craft was about thirty feet long and had a top speed of six miles an hour.

We set out about ten o'clock that night for the Russell Islands to land supplies and pick up an SBD pilot and his gunner who had been forced down. We arrived about noon the following day (November 3) and remained until two o'clock the next morning. In the interim, we searched an adjoining island for three Japs the natives reported were stranded there. We failed to find the Japs but we destroyed their clothing and food.

From the Russells we chugged over to the back side of Guadalcanal to pick up another SBD pilot and a Marine fighter pilot. The former had been lost for twenty-eight days.

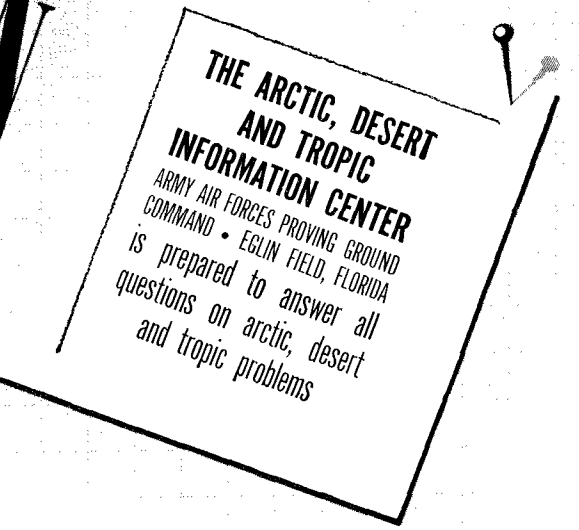
We finally made it back to the base late in the afternoon. I was fed up with water travel. Six days in canoes and two in a small boat made Henderson Field and its aircraft look like heaven to me.

Little the worse for wear, I was back in the air after a day's rest.

By the way, "Tojo" got his job digging graves. ☆

INFORMATION

- if you please!



By Lieut. Col. H. O. Russell

DIRECTOR, ARCTIC, DESERT AND TROPIC INFORMATION CENTER, EGLIN FIELD, FLORIDA

GLOBAL war confronts us with a dual fight. Not only must we overcome the enemy, but we must also conquer the obstacles of climate and terrain and disease, and solve a host of unfamiliar problems in every corner of the earth.

To win wherever we fight—on the ground and in the air of the frigid arctic, the arid desert and the steamy tropics—we must first know what is in store for us. We must know the conditions that exist in every combat zone in which we operate. More than that, we must be prepared to cope with these conditions.

The collection, evaluation, preparation and dissemination of information on all problems arising out of arctic, desert and tropic operations is the job of the Arctic, Desert and Tropic Information Center (ADTIC). Its directive from the Commanding General of the Army Air Forces reads:

"There will be organized and operated by the Commanding General, Air Forces Proving Ground Command, at Eglin Field, Florida, an Information Center for the purpose of collecting, recording, coordinating, and preparing for publication pertinent data bearing upon the specialized operating conditions encountered by the Army Air Forces in conducting operations in arctic, desert and tropic areas."

The ADTIC was created solely to serve the Air Forces, to provide to its various commands information both of a general and specialized nature covering all phases of Air Force activities in arctic, desert and tropic areas. This takes in the operation and maintenance of all Army Air Forces equipment, including such problems as shelter, food, medicine, clothing, and the selection and care of personnel. Special emphasis is placed on studies to develop the best procedures for use in cases of forced landings, and to recommend emergency kits and survival methods for those forced down as well as procedures for secure crews. Other activities include recommendations regarding manning tables and tables of basic allowances and recommendations for appropriate actions based upon research, findings and conclusions.

The ADTIC exists to furnish information requested by the divisions, directorates and commands of the Army Air Forces. It undertakes such special studies as may be directed by the Commanding General of the Army Air Forces. It is concerned with the collection and dissemination of all possible information on air operations under the peculiar conditions of the arctic, desert and tropics. This information is prepared for publication and dissemination to the service in the form of technical manuals, technical orders, training manuals and special studies.

THE reservoir of information available at the ADTIC is constantly supplemented by the activities of a large group of experts, information collectors, researchers, writers and special consultants. Nucleus of the organization are experts on the conditions in each zone. These constitute leading scientists, geographers, explorers and pilots who are authorities in their fields and qualified to evaluate both general and specialized information. They are assisted by a group of information collectors and reporters who gather data from every conceivable source. Information is gathered by various liasion officers from intelligence reports, from returned combat pilots, from the experience of our allies, from interviews with competent observers, and from a variety of publications. Consultants in all specialized fields are available for assistance on a multitude of problems. Leading research libraries and institutions, as well as industrial enterprises with world-wide interests, contribute relevant information drawn from their files.

The ADTIC is constantly working on problems and projects originated within its own organization, with a view toward immediate or future usefulness. But its major function is to supply information on pressing current arctic, desert and tropic problems of the various Air Force units. Such requests are assigned to specialists in the field in which they fall. Under the supervision of the zone head, information is collected or drawn from ADTIC files. It is evaluated and coordinated by competent authorities and then placed in the hands of writers who shape its final form, either as a publication or a special study report.

The effectiveness of the ADTIC is in direct proportion to the use made of its services. It exists for the sole purpose of serving the Army Air Forces. It has the resources and the capacity to furnish information on every phase of Air Force operations, and it solicits the problems of all units which may either be operating or planning operations in arctic, desert, or tropic zones. Information on the aspects and prevention of frost-bite may be required. The ADTIC has the facts. Or you may want to know the problems and best solutions for the maintenance of aircraft under conditions of desert dust and sand. The ADTIC has the facts. Or you may want vital information on the procedure for survival for personnel forced down in the jungles or New Guinea, or on the Libyan Desert, or in the desolute wastes of Alaskan tundra. The ADTIC can and will help.

This, then, is the Arctic, Desert and Tropic Information Center. It has been established, and it works for you in the Army Air Forces—to help you understand what you will be up against in arctic, desert or tropic zones—to help you meet strange and difficult conditions, to help you win out over them, and to do your job safely and well. We urge you to make use of the ADTIC. It is ready and willing to serve you.

What's your AIR FORCE I.Q.?

The puzzle department worked overtime to produce this month's collection of Quiz stumpers—so *en garde!* On the basis of five points for each question correctly answered, a score of 100 puts you at the head of the class; 90 is excellent; 80 good and 70 fair. You'll find the answers on Page 40.

1. As the bomber flies, it is approximately how far from London to Berlin?
- a. 570 miles
- b. 720 miles
- c. 805 miles
- d. 430 miles

2. The Fairchild AT-14 has
- a. Two radial air-cooled engines
- b. One radial air-cooled engine
- c. Two inline air-cooled engines
- d. Two inline liquid-cooled engines

3. What is a line squall?
- a. An argument on the line
- b. A slowly moving weather front
- c. Heavy storms, particularly in the summer
- d. An intense cold front accompanied by storms

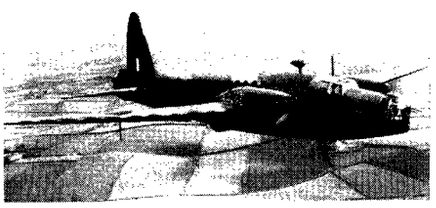
4. The proper procedure for an emergency water landing is
- a. Gear up and no flaps
- b. Gear down and no flaps
- c. Gear up and flaps
- d. Gear down and flaps

5. Luke Field is located near
- a. St. Luke's, Arizona
- b. Amarillo, Texas
- c. Phoenix, Arizona
- d. Fort Worth, Texas

6. What is the equivalent Army rank to a Commander in the Navy?
- a. Captain
- b. Colonel
- c. Lt. Colonel
- d. Brig. General

7. The tachometer indicates
- a. The temperature of the air around the engine
- b. Oil pressure in the lubricating system
- c. The revolution-per-minute of the engine
- d. The relative speed of two engines

8. The plane below is a
- a. Wellington
- b. Lancaster
- c. Liberator
- d. Blenheim



9. The Messerschmitt 110 is a
- a. Single seat, two engine fighter
- b. Single seat, single engine fighter
- c. Two seat, two engine fighter
- d. Multi-place, four engine bomber

10. The identification letter "F" refers to a
- a. Photographic plane
- b. Observation plane
- c. Glider
- d. Autogiro

11. If a man becomes unconscious in flight due to a faulty oxygen supply, the best thing to do is shake him severely in an effort to revive him.
- a. True
- b. False

12. Casablanca is in Algeria?
- a. True
- b. False

13. Pyrotechnic signals make use of
- a. Smoke columns
- b. Flashlights
- c. Fireworks
- d. Cannons

14. Which of these is an adaptation of a slogan popular during the Spanish-American war?
- a. "Thumbs Up"
- b. "Keep 'em Flying"
- c. "Remember Pearl Harbor"
- d. "We Do Our Part"

15. Four minutes of time equals
- a. One degree of longitude
- b. One minute of longitude
- c. 15 degrees of longitude
- d. 360 degrees of longitude

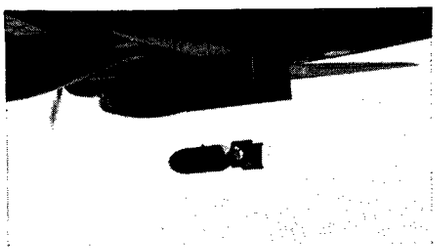
16. The monthly bonus for paratroopers who do not otherwise receive flight pay is
- a. $50 for officers; $25 for enlisted men
- b. $50 for both officers and enlisted men
- c. $100 for officers; $50 for enlisted men
- d. Fifty percent of base pay added

17. The expression "buzz the field" means
- a. To fly low over the field
- b. To contact the control tower
- c. To call the operations office
- d. To locate the field on the map

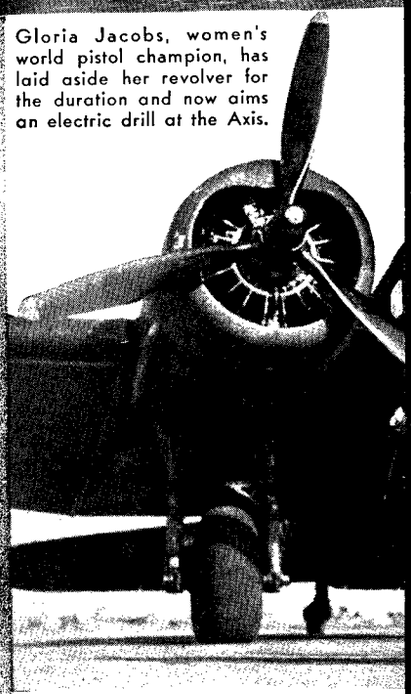
18. The newly adopted popular designation for the B-26 is the
- a. Mitchell
- b. Liberator
- c. Marauder
- d. Havoc

19. What is the International Code for "all clear"?
- a. QQZ
- b. QQW
- c. QQQ
- d. QQS

20. This bomb being dropped below weighs
- a. 500 pounds
- b. 2,000 pounds
- c. 100 pounds
- d. 1,000 pounds



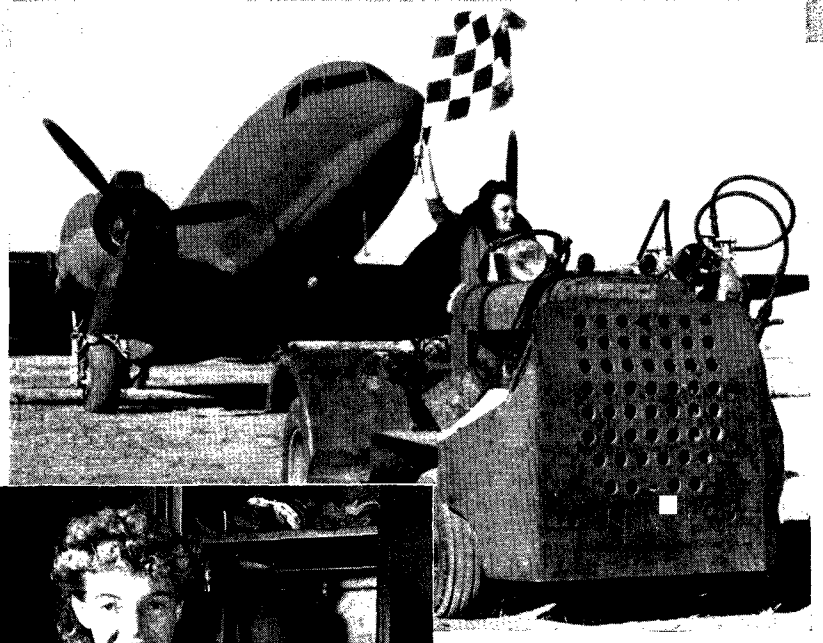
Gloria Jacobs, women's world pistol champion, has laid aside her revolver for the duration and now aims an electric drill at the Axis.



Dixie Hammill (below) has exchanged study of art for the study of motors at McClellan Field, Cal., where she specializes in motorcycle maintenance.

THE Women in the Air Forces

COMING from the school room, home and the department store counter, women are daily releasing scores of men for combat service as they take over an ever increasing assortment of Air Forces jobs. Here some modern members of the "air sex" are shown performing vital tasks that range all the way from strenuous ground crew duties to actually taking ferry planes into the Air Force's own "wild blue yonder".



Hauling all types of planes to and from the line is just one of Evelyn Chisum's jobs at McClellan Field. She also stands by with fire extinguisher for emergencies and even removes wheel chocks for take-offs.

At Duncan Field, Texas, Mrs. Carrie Fuller and Mrs. Kathleen Birchfield carefully hang and air out a parachute before it is turned over to the riggers for packing. Moisture in the parachute might prevent its opening.

Geraldine B. Keyes, Alice H. Harris and Janet Walker are going aloft in an army transport to "get the feel" of flying. They are plane dispatchers, and issue flight sheets to transient pilots at the Sacramento Air Depot.

The responsibility of packing parachutes is entrusted to Barbara Towne, shown above at the New Castle (Del.) Army Air Base. Barbara is a WAF and holds a pilot's license.

Helen Richards is only twenty-one—but she already is a flying veteran with five years piloting experience. Helen, who is attached to the New Castle Air Base, is also the youngest member of the WAFS.

WHAT KIND OF OFFICERS?

(Continued from Page 13)

co-ordination of all these normal thoughts, inclinations and acts. This is necessary in order that a high and dependable degree of that "mental attitude and state of training which renders obedience instinctive under all conditions," known as discipline, may prevail in his character and future conduct.

In order to attain this highly desired state, the individual responsible for the training at once runs afoul of that very thin dividing line between discipline and morale, beyond which one of these qualities may not advance without the weakening or destruction of the other. In my mind, the two are inseparable and of no value when divorced. The Army is spending millions in the study and service of "morale" and many times this expense and effort in some organization has been nullified by the improper application of training methods on the part of some officer with no conception whatever of individual or mass psychology or even the simple fundamentals of human understanding.

Let's start at the beginning with a cadet. He was a civilian or former soldier from either an average or above the average station in life and more often than otherwise just a student in school when he answered the call to arms and the urge to fly. He suddenly found himself in the midst of a wartime Army made up of other civilian, nonprofessional soldiers and officers together with the highly trained "regulars." He had heard that this same kind of Army learned from the last war that a more democratic policy and a closer relation between officers and men had made it then- and has made it now the most efficient and loyal army, with the highest degree of morale of any armed force on earth. Yet, since he had become a cadet, it's quite possible that he had come all the way to the graduation ceremony without any personal evidence that such a condition even existed.

Discipline is probably the most important element in the training of any regimented mass of men who must function together or in co-ordination with other groups of men. Even the technical or professional use of their weapons or equipment is of little team value unless under the perfect control of discipline. The only problem in my mind, therefore, is the proper way to instill it in a group of men so that it becomes an integral part of their voluntary mental process rather than just a veneer worn for special occasions when some officer is present to use the authority rank gives him. All of which brings us to the question, and the answer, leadership. On this, and on this alone, depends the success of any military mission, either in training or actual combat.

There are few officers who can be strictly "iron pants" to the extent of being utterly devoid of human sympathy, a sense of humor, interest or pride and satisfaction in their men and ever command respect, loyalty or affection.

Any officer, by virtue of his rank, is in position to impose his will on the men under him. Yet if abusing that authority is his only claim to the title, he is not the kind of officer this, or any other army needs, although he may rate himself a great disciplinarian.

Unless an officer, by his own ability, deportment, courage and fair dealing can command respect and loyalty in his men, he may look behind him some day in this war, when the going is tough, and find them all AWOL, except the few taking a bead on the back of his neck. And that kind of shooting is not the result of proper discipline.

When a cadet enters preflight he is starting from scratch in Army drill, customs, courtesies and other disciplinary phases of training. From there through his basic stage he must get it without relenting, so that it finally becomes a part of him. Even through these stages, however, a spade can be called a spade without hitting him over the head with it, and a command or a reprimand can be given in a strictly impersonal and military manner rather than with the tone or attitude of a personal insult. It is foolish and entirely unnecessary to treat them as children or some low form of animal life. Such only breeds resentment and antagonism in their minds to the point that any requirement you have of them must be demanded and enforced, whereas, with a different attitude it might be yours for the asking. I have had many tell me, after graduation, when discussing their training, that they have gone to the flying line day after day so mentally tense and upset from bitterness and resentment of personal treatment they were unable to relax enough in the cock-pit to get anything at all out of that period of training. I have had many also tell me that mine was the first "At Ease" to be given them regardless of how long they had been standing at "Attention" talking to an officer. Another expressed his appreciation of the fact that some officer had said, "Good morning," as he returned a salute. These are little things that I did not realize were of any importance. Yet having them called to my attention brings forth the unreasonable argument that so long as a man knows how and when to snap to "Attention" and does so, then an officer might well live up to his part of the procedure, which requires that no man be kept in that position any longer than necessary.

In other words, a man's entry into the Army is the beginning of a two way obligation. His is to obey orders, accept any type of training or duty prescribed, keep himself clean and conduct himself in a manner reflecting credit to the service. The Army at the same time obligates itself to place that man in the charge of an officer qualified to clothe, train, and feed him; safeguard his health and personal welfare; administer and protect his military affairs and interests; advise him on personal problems, and by every means available keep him happy both on and off duty. If that officer falls down on any part of his obligation, he usually gets a reaction in kind as a reward.

There is another angle to the making of a good officer, and that is the susceptibility of cadets to examples set by officers. Therefore, any officer concerned with their training should by his own appearance, manners and conduct, on or off duty, as well as the way he carries out his training function, stay acutely conscious of this fact at all times. I recently saw a Captain remain seated with his feet up on the top of his desk, collar open with tie slipped down, greet the Commanding Officer of the post in the presence of several cadets with a casual wave of the hand. If Army discipline irks them now, I'm sure they can hardly wait until they get commissioned so they can get as sloppy as that Captain was, particularly if he should happen to be any one of the "idols" which they each pick wherever they go.

When cadets arrive at an advanced school they are on the last lap. If they haven't absorbed enough military training, other than flying and technical lessons, to qualify them as officers, then it is time the Army finds it out before they are commissioned. You can't possibly determine what a man has in the way of ability, force of character, sense of responsibility or initiative until you give him some responsibility and the chance to demonstrate those qualities and prove that he is capable of thinking and acting along the right lines for himself.

During this last advanced phase, flying and gunnery take up much of the cadet's time formerly spent at drill. It seems to me that in addition to perfecting his flying technique and teaching him to shoot, the cadet should also be directed toward that mental transition necessary to his changing from the status of an enlisted man to that of an officer. He knows by this time what the service requires and expects of him, and he knows the difference between right and wrong where his conduct is concerned. If he is not qualified at this stage to think and act like an officer and be given a chance to display initiative, sense of duty, honor and other characteristics we should know about, he won't be a few weeks from now. Pinning the bars on him won't automatically make an officer of him—he must do that for himself, mentally, and if he fails that test now, it will be much better than waiting until after he is commissioned.

He should be kept reminded that regardless of how high he might go in rank, he must still be governed by regulations and be subject to discipline in his duty and living. Still he must be made to feel that he is a human being whose feelings you consider and whose opinion on various matters you are interested in and value. A few extra personal courtesies, without even approaching the line of familiarity, go a long way in eliminating the low outlook on life and a possible inferiority complex they may have acquired along the line.

To sum it up, these boys have a big job to do and if, during their training we can let them know we are trying to turn out men in whom we have pride and confidence, it may help them to that very desirable estimate of themselves. ☆

ARMY'S FLYING WINDMILL

(Continued from Page 6)

mile and the ceiling to the tree-tops. It would, of course, have been possible to land at any time, but the pilot managed to get through by stopping in mid-air and then cautiously and slowly going around the wooded areas.

A great number of the landings and take-offs during the eight months of testing were made from a 20-foot square platform raised three feet above the ground.

The aircraft has hovered 20 feet above the earth while the observer climbed down a rope ladder to the ground and later climbed back to the ship. This foreshadows the practicability of landing or retrieving personnel in wooded or jungle country where even the helicopter could not land.

On low-pressure floats, the aircraft can land on any type of surface—on ground, water, marsh, snow or thin ice. Since it needs no prepared landing field, the helicopter may be able to provide excellent liaison and cooperation with ground forces. Because its forward speed can be reduced to zero, it can fly through visibility that is practically zero, literally feeling its way through the air by flying around trees and over buildings and hills. It also could be operated as an elevated observation platform for the direction of artillery fire, direct-line telephone conversation being practical if desired.

Despite its slow speeds, the helicopter probably would be less vulnerable to enemy attack than would a liaison plane because, having no wings, it is more difficult to see. Because it can hover stationary in the air, it also could be camouflaged to blend with ground colors. Nevertheless, such aircraft, lacking defensive armament, would not be expected to subject themselves to attack.

For night missions this aircraft would be a real threat in behind-the-line operation. The exhaust could be easily muffled; no propeller noises exist. It therefore could operate in almost complete silence.

Other operations that might be performed by a helicopter in combat areas include: the landing and rescue of agents at night in enemy territory, transport of personnel and critical material to inaccessible locations, rapid evacuation of wounded near the front lines, limited types of bombardment, photography, and the unreeling of communication wires over rugged terrain.

According to some authorities, the helicopter might operate from the decks of merchant vessels in convoy, searching out submarines and dropping depth charges directly on them when discovered.

Despite the successful experiments with the helicopter, there still remains a tendency to regard the aircraft as an interesting phenomenon of little practical utility. However, competent authorities believe that present knowledge is adequate to design and construct a successful helicopter of approximately 6,000-pound gross weight which could carry a useful load of nearly 50 percent of the gross weight. Although high speed is not of first importance, it should exceed 100 m.p.h. Range, endurance and military load capacity would be ample for many missions—missions hitherto impossible or extremely dangerous because of the limitations of high-speed aircraft.

THIS FIRST AAF helicopter was manufactured by Vought-Sikorsky after many years of development and experimentation by civilian engineers of the manufacturer and engineers of the AAF Materiel Center.

It is a two-place cabin ship powered by a Warner 165 hp. engine. It has one main lifting rotor and a small vertical tail rotor with variable pitch blades that serves to correct the main rotor torque. The pitch control mechanism of this tail rotor is connected to the rudder pedals, which also gives directional control.

The pitch of the main rotor blades may be increased or decreased at will as they pass any desired point of rotation with a corresponding but opposite variation of pitch at 180 degrees. This is called "azimuthal" or "cyclic" pitch control, and by this means lateral and longitudinal control are obtained. This pitch control mechanism is actuated by the stick, which acts in flight much like a normal control stick connected to aileron and elevator, except that in the case of the helicopter all controls are fully effective at zero forward speed.

Climb and descent are obtained by simultaneously increasing or decreasing the pitch of all main rotor blades, together with use of the throttle. This is termed "collective" pitch control. Since an increase of rotor pitch requires more horsepower to maintain the rotor at whatever r.p.m. is desired, there is a synchronizing mechanism that opens the throttle as the pitch is increased and thus maintains nearly constant engine and motor r.p.m. despite pitch changes.

Of course, there must be a clutch and transmission between engines and rotor, and also a "free-wheeling" device to permit blades to continue turning if the throttle is closed or the engine fails. In the event of engine failure, the helicopter becomes, in effect, an autogiro with all the slow landing characteristics of the autogiro. This is not theory. Not only has the helicopter purposely been landed without power, but there have been instances of actual engine stoppage where such landing was a necessity. Also, normal descent from altitude to near the ground is made without power and with the blades in auto-rotation. This point is stressed, for many ask "What happens in the event of engine failure?"

Perhaps it would be interesting to go through the motions of flying the ship.

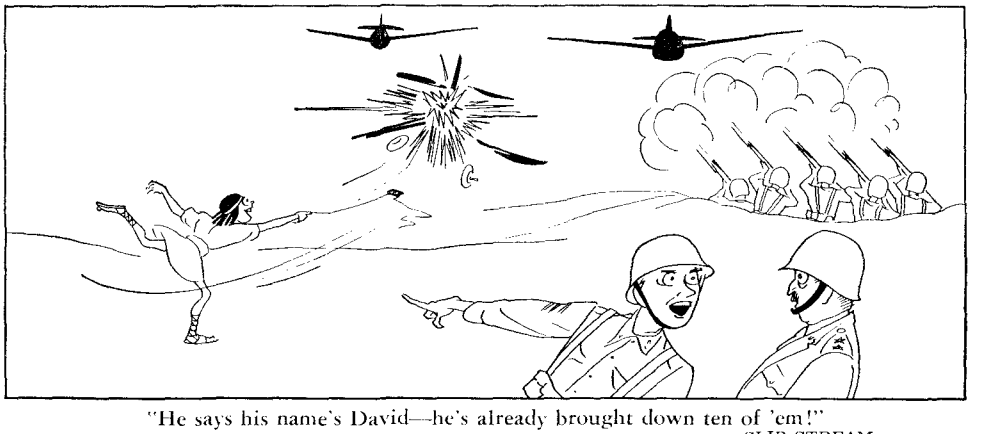
With the rotor clutch disengaged and the rotor brake on, the engine is started in a normal manner. When ready to take off the rotor clutch is engaged with the main pitch control in low pitch position. The rotor blades are now turning and the stick and rudder held in neutral. The rotor is now brought up to desired r.p.m. and the pitch of the blades increased until the ship leaves the ground in vertical climb.

By slight adjustments of the controls the aircraft may be held stationary a few feet from the ground—or at its vertical ceiling—as long as desired. When forward flight is desired, the stick is pushed forward somewhat, the ship noses down slightly, picks up speed and commences to climb, since less power is required for level forward flight than for hovering.

Not only is it possible, but quite normal, to fly the ship backwards, sideways, or to revolve on the ship's vertical axis over a fixed spot. In flight, stick and rudder operate much like those of a conventional "frozen wing" aircraft, except that they are quite sensitive and the tendency is to overcontrol. There is one difference, however; control over climb is a function of the main pitch control in conjunction with the throttle. This, at first, is confusing to the pilot accustomed to fixed-wing airplanes.

Through the many months of experimental flight testing, the Army Sikorsky Helicopter turned up only minor mechanical bugs, which is an unique record in the history of new-type aircraft. It had a motor failure in flight once, but it just windmilled down to the ground.

That's the way you bring it down: cut the motor and glide down like an autogiro. Forced landings are little different from normal autogiro landings. Normal helicopter landings, however, are made with power, the craft touching the ground so gently that even eggs are not broken. This actually was tried on one occasion by suspending a net with a dozen eggs below the helicopter. Not an egg was cracked on touching the ground. ☆



"He says his name's David—he's already brought down ten of 'em!"
—SLIP-STREAM

Sgt. J. C. Komurke

DISTINGUISHED SERVICE CROSS

LIEUTENANT GENERAL: George C. Kenney. **BRIGADIER GENERALS:** Kenneth N. Walker (Also Silver Star), Ennis C. Whitehead. **LIEUTENANT COLONELS:** F. R. Stevens*, W. C. Sweeney, Jr. **CAPTAINS:** J. L. Dufrane, Jr.*, Dean Hoevet*, R. G. Ruegg, Stephen M. Smith (Also Purple Heart). **LIEUTENANTS:** Frank H. Beeson, Willis W. Burney*, P. B. Gambonini, H. S. Grundmann*, Hoyt A. Jolly, Jr., Gerald McCallum*, D. S. Muckley*, R. V. M. Negley, Jr., R. F. Starks (Also Purple Heart), William L. Turner, William S. Watson, Richard M. Wood. **SERGEANTS:** David W. Brown, C. M. Czechowski, A. A. Liimatainen, Rex E. Matson, Fred W. Oettel.

DISTINGUISHED SERVICE MEDAL

MAJOR GENERAL: George A. White*. **BRIGADIER GENERAL:** B. B. Sommervell (Also Oak Leaf Cluster). **COLONELS:** Clifford P. Bradley, Donald N. Yates. **LIEUTENANT COLONELS:** Warren J. Clear, Townsend Griffis.

SILVER STAR

LIEUTENANT COLONELS: William Basye, James W. Twaddell. **MAJORS:** John H. Payne, R. V. Schwanbeck (Also Purple Heart). **CAPTAINS:** Bernice S. Barr, Paul I. Gunn, Ronald D. Hubbard (Also Oak Leaf Cluster), Clyde B. Kelsay, James R. Smith, John W. Wilkinson. **LIEUTENANTS:** Malcolm R. Anderson ,Theodore Arter, III, Frank P. Bender, Raphael Bloch, Jr., Roscoe G. Booth, Joseph W. Brookhart, Olen C. Bryant, Chester H. Budz, Kenneth E. Burch, Claude N. Burcky, Morris C. Caldwell*, Darwin K. Carpenter, Edward J. Chudoba, John D. Crawford, Charles R. Crowell, John L. Dains (Also Purple Heart*), Harry W. Ebert, Jr. (Also Air Medal), David C. Everitt, Jr., Leslie W. Felling, John D. Feltham, Fred T. Burchner, David L. Gaede, Robert C. Gaskell, Balfour C. Gibson, Donald E. Good, Theodore S. Green (Also Oak Leaf Cluster to Silver Star and Purple Heart), Robert J. Haase, Dale E. Hanson, Gustave M. Heiss, Jr. (Also Oak Leaf Cluster), H. N. Henckell, Jr., James T. Holcomb, Allen V. Hopkins (Also Purple Heart), Kenneth F. Horner, Wallace J. Hoskyn*, Leonard S. Humiston, Sidney O. Ingram, Jr., Henry S. Iverson, William G. Ivey, Willie E. Jacobs, Clarence T. Johnson, Jr. (Also Oak Leaf Cluster), Robert T. Jones, Gus Kitchens, James P. Larronde, Richard R. Lehr, Yale H. Lewis, L. L. Limpach, Wade H. Lowry, James B. McAfee, Hugh Mahoney, James H. Mangan, Ray Melikian, Hiram A. Messmore (Also Purple Heart), Edward M. Miller*, Richard G. Miller, Robert C. Miller, John C. Minahan, John M. Moore, Wesley D. Morris, Harry L. Moy, Albert T. Nice (Also Oak Leaf Cluster), F. A. Norwood, Malcolm E. Peterson, Arthur J. Platt, Robert R. Rankin, Paul E. Ray, Philip D. Reece*, Ernest L. Reid, C. L. Richards (Also Purple Heart), W. H. Robert, Jr., E. W. Robinson, J. M. Rowland*, Adrian J. Sampeck, J. S. Sauber*, P. J. Scarboro, L. A. Schauer, J. R. Schrom, V. A. Schwab, Ralph L. Scmidt (Also Distinguished Flying Cross). R. A. Scurlock, W. E. Seamon, Jr. (Also Oak Leaf Cluster to Silver Star), William D. Sells, Steward E. Sewell, I. H. Shearer, Earl Sheggrud, Walter G. Shore (Also Oak Leaf Cluster to Silver Star), Cecil B. Smith, Marlin R. Smith, Richard Spotswood Smith, Vincent L. Snyder (Also Distinguished Flying Cross), Edward H. Steere, Jr., L. A. Stoddard, Maxwell D. Stone (Also Oak Leaf Cluster to Silver Star), George A. Stout, Coleman Stripling, Henry G. Swartz, Thomas P. Talley (Also Oak Leaf Cluster to Silver Star and Purple Heart), Paul R. Tarbutton, John R. Taylor, Albert Thom, W. P. Thorington, Clay Tice, Jr., R. G. Toler, E. C. Townsend, Clifton H. Troxell, G. A. Uhrich, Robert H. Vaught, Oliver B. Vodrey, Clyde H. Webb, Jr. (Also Oak Leaf Cluster to Silver Star*), Everett C.

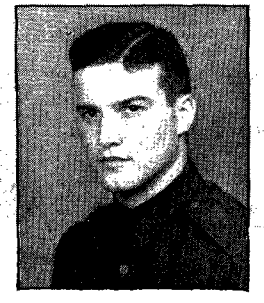
Lieut. H. A. Jolly

Lieut. G. M. Heiss

Lieut. C. B. Kelse

*Posthumous

ROLL OF HONOR

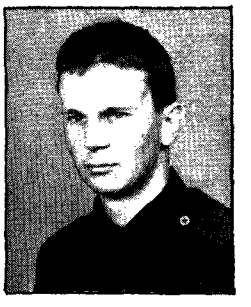


ieut. R. G. Booth

Lieut. J. H. Disbro

Lieut. F. B. Bender

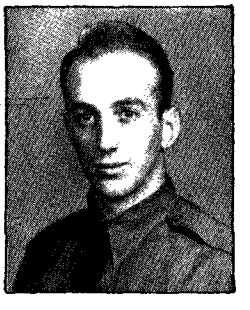
.ieut. W. G. Ivey



Capt. J. A. Glenn, Jr.

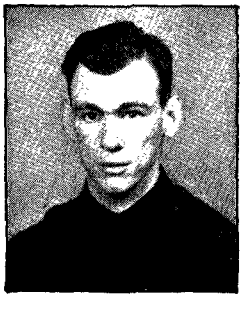
Lieut. D. C. Everitt

ıt. U. P. Thorington



Capt. Samuel Maddux

Lieut. D. E. Good



t. W. B. Drysdale

Lieut. Raphael Bloch

Sgt. J. D. Sullivan

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(Continued on next page)

bro, Fred G. Henry, Rowland F. Holbert, J. A. McCullough, Lawrence R. Mesereau, J. C. Poire, Earl S. Ripley*, Robert P. Spreng*, Homer R. Taylor, T. E. Walker. **MASTER SERGEANTS:** Thomas L. Daly, Jack G. Evans, Ray A. Oliver (Also Distinguished Flying Cross), R. T. Ullrich. **FIRST SERGEANTS:** Edward J. Burns, Frank B. Helms, H. C. Sanders, C. A. VanWirt. **STAFF SERGEANTS:** Leonard C. Baker, James M. Barksdale*, Frank W. Bowen, John P. Butler, Erwin B. Casebolt, Frank J. Depolis*, George G. Dudley, Allen R. Durborow, Jr., A. A. Infantolino, I. A. Falkenburg, R. I. Gangursky, Joseph E. Good*, Joseph C. Herbert*, Charles W. Hodder, Ralph Kelly, Stuart E. Lamere, Edwin K. Lyle, Darrell W. Mintz, Cryial A. Moore, Roland L. Nuttall, Michael J. Pirga, H. T. Randall, A. B. Restivo, George Sallick, J. P. Seals, V. O. Schwartzkopf, James E. Swanson, Arnold M. Thompson, Joe O. Wright, Charles L. Zeiss. **TECHNICAL SERGEANTS:** S. A. Androkovich, John F. Bauer, John T. Benton, Daniel A. Dyer, Harold H. Gwynne, Alonzo J. Jones, James W. McAdams, Robert W. Ray, H. S. Simpers, C. E. Stinson, W. R. Towsley, James E. Young. **SERGEANTS:** Howard Baldwin, J. W. Bartee, Leonard Blackmon, William M. Bryant, Guy E. Clanton, Kenneth A. Cooper, Eugene C. Cox, Fred A. Dabney, Jr., James H. Derrick*, Jesse D. Gaines, H. L. Gilbreath, Edward J. Gudinas, Bruce T. Harlow, Charles R. Heiahorst, George Missel, Thaddeaus Kusior, Richard A. Larson, Robert L. Long, Owen E. Longest, Harry McHayes, James W. Miller, Jimmy D. Morris*, C. J. Nourot, Jr., Robert C. Owens, Howard S. Petersen, W. J. Price, Jr., Paul D. Reber, Jack A. Roberts, T. E. Roberts, G. R. Schmersahl*, R. O. Sherman*, Julius B. Sidak, Marion K. Smith, Joe B. Stanley, Robert K. Stone, C. F. Viebrock, Lester E. Wagaman, Charles E. Waite, Jr., Joe F. Wilson, T. A. Yarbrough, Lionel G. Young. **CORPORALS:** Donald D. Adams, Robert E. Bloom, Thomas E. Bradshaw, Malachy J. Cashen*, Shelly E. Cockroft, C. F. Currence, Jr., James F. Ewers, Alfred A. Fawe, Noah Frequez, Thomas D. Goodman, Edward L. Gummelt, Henry L. Hammond, Chester L. Hatcher, Vincent M. Horan*, Elbert E. Howell, Henry T. Kelly, Lester W. Klahn, Glen W. Lingle, John P. Loos, William F. Loranger, J. R. MacMillan, Raymond E. Miller, John G. Mitchell*, Leith C. Morgan, George W. Mosall, James I. Moyer, W. H. O'Brien, Jr., John E. Ochs, A. V. Prioreschi, James W. Pryor, R. G. Reddick, Norman A. Smith, Robert C. Smith, Jonah Steff, Edward J. Urbanski, J. L. Viers, M. S. Whimsett, L. R. Wilson, Sam H. Wilson, D. E. Wimbiscus. **PRIVATES FIRST CLASS:** Samuel E. Ashker, Fred F. Baker, Thomas E. Bellue, Theodore F. Byrd, Jr.*, Carlo A. Calemine, Arthur E. David, Joseph E. Demott, Carl Drechsler, S. H. Enchelmeyer, Vernon W. Evan, Edwin Frazier, Harold L. Henley, Lawrence B. Howland, George O. Jenkins, Russell J. Kawa, Donald A. Kern, Cecil E. King, John D. LeBlanc, Albert C. McCall, Jr., Karl O. Maser, Robert F. Nolan, Joseph A. Paradiso, M. M. Praniewicz, Ralph N. Rentz, E. B. Rodriguez, R. B. Rodriguez, A. J. Samuelvich, A. L. Sesody, A. Shullenbarger, N. J. Spallone, J. C. Stanfield, W. A. Stanley, H. E. Tholke, W. R. Thornhill, Paul N. Tomkins, Domenico A. Tussio, John Tyleshevski, C. L. Uhlenburg, Howard C. Ward, Edward M. White, Jack A. Williams, Arthur J. White. **PRIVATES:** Joseph Bush, Erwin E. Crocker, Sydney A. Davis, Harry O. Dodd, Richard S. Garrety, Walter J. Gese, John B. Hall, Turner G. Harrell, Harold H. Hawkins, Chesley A. Isaac, Clyde D. Johnson, Sherwood D. King, Pierre A. Kobylinski, John N. Krison, Ivan C. Lewis, L. G. Luckey, W. F. Lundgren, Merion L. Mason, R. R. Niedzwiecki, William H. Peterson, Robert L. Pickerel, M. L. Richardson, B. D. Sbraccia, George S. Snyder, H. M. Spickler, L. G. Strunk, Jr., R. H. Suffern, Hans S. Thon, D. E. Tobias, V. D. Tomlinson, R. L. Turnbull, Lumus E. Walker*, Frank L. Wallace, Allan J. Weber, Kenneth H. West, Lewis B. White, L. J. Wiedling, Vaughn E. Wolfe, Ralph W. Young, Jr., A. A. Zangari.

Posthumous

DISTINGUISHED FLYING CROSS

LIEUTENANT COLONEL: Harry T. Eidson (Also Air Medal). **CAPTAIN:** Joseph H. Moore. **LIEUTENANTS:** William S. Barnes, Norman Davis, David C. Howard, C. J. Nielsen, A. M. Rulison*, B. J. Stone, Jr., W. E. Strathern. **MASTER SERGEANT:** Joseph G. Moran. **STAFF SERGEANTS:** John J. Hudjera, William C. Jones*, Leo J. Zulkowski. **TECHNICAL SERGEANT:** Frederic S. Moran. **SERGEANT:** J. D. Sullivan. **CORPORALS:** Presley C. Broussard, Leo P. Flowers. **PRIVATE FIRST CLASS:** J. E. Schoen.

SOLDIER'S MEDAL

LIEUTENANT COLONEL: Roscoe T. Nichols, Jr. **LIEUTENANTS:** Thomas J. Burke*, Sherman A. Copeland, Therman L. Patrick, Norman B. Willey. **FIRST SERGEANT:** Lloyd E. Swope. **STAFF SERGEANTS:** J. B. Bowers, Robert W. Gabriel. **TECHNICAL SERGEANTS:** M. C. Shelnutt, Thomas P. Walsh. **SERGEANTS:** Clarence J. Cole, Acy B. Dubon, Gordon G. Farrell, Charles J. Hoffman, Harold J. Jackson, William A. Karges (Also Oak Leaf Cluster), John Klingenhage, Robert G. Lee, W. G. Richards, Henry E. Swartz, Harvey H. White, Lacy W. White, Jr. **CORPORALS:** Douglas H. Dickerson, Manuel D. Guerra, Lloyd N. Lovell, Don J. Spiers, Albert H. Squires, Earl Thalwitzer. **PRIVATES FIRST CLASS:** Frank Tino, Jr., Ray E. Wisdom. **PRIVATES:** C. D. Cooper, Murray N. Goldstein, Gordon Harrison, Harold V. Keahey, V. T. Pierrellee, Michael V. Repko, W. S. Smart, Charles M. Steward, Orbin R. Truett, S. B. Ziolko.

AIR MEDAL

COLONEL: S. J. Davis. **LIEUTENANT COLONEL:** Fred M. Dean. **MAJORS:** D. B. Avery, C. B. Collier, Glenn E. Hubbard, Claude Putnam, R. F. Rudell, C. F. Skannal, Harrison Reed Thyng (Also Oak Leaf Cluster to Air Medal), John W. Weltman, John O. Zahn. **CAPTAINS:** K. B. Benson, C. A. Christmas, L. F. Deegan, W. T. Duden, Thomas B. Fleming, Joseph A. Glenn, Jr., James Harman, Edward G. Johnson, George J. LaBranche, R. E. Lehr, W. M. Lively, F. H. McOlgin, F. J. Miller, Homer H. Noss, R. A. Nowotny, Joel A. Owens, Jr., F. L. Perrine, T. H. Runyon, W. A. Tesch, Kenneth D. Vandayburg, J. B. Wakefield, Victor Emanuel Walton, Darrell G. Welch, Charles E. Wilson. **LIEUTENANTS:** Lyle Albert Bean, Robert N. Chenoweth, W. B. Drysdale, David R. Everett, Elmer Hartman, William K. Hester, Earl W. Hille, Jr., Jack M. Ilfrey, Earl C. Kent, Stephen N. Krenytzyk, J. C. H. Lentz, William K. Long, R. W. McWherter, H. O. N. Mendenall, Howard Warren Millard, M. C. Morrison, R. D. Neale, Jr., Edward S. E. Newbury, Charles W. Oakley*, L. B. Page, James E. Pate, W. S. L. Pennington*, W. M. Pringle, Jr., Robert B. Riley, N. O. Roberts, George L. Ross, Richard H. Schoenberger, Joseph D. Shaffer, E. E. Shahan, Henry K. Smith, D. O. Starbuck, Roger F. Stemen, R. L. Stevens, J. A. Sullivan, Carlus Turner, E. F. Umphrey, Burton L. Weil, Norman L. Widen, Bill F. Williams, R. E. Williams, J. L. Wolford. **MASTER SERGEANT:** Joseph H. Sitlik. **STAFF SERGEANT:** Frank S. Tamsett. **SERGEANTS:** John Burger, Ira C. Robertson. **CORPORALS:** Jelacio M. Canapi, Robert W. Skarie. **PRIVATE:** James N. Thomas.

OAK LEAF CLUSTERS

BRIGADIER GENERAL: Caleb V. Haynes. **LIEUTENANT:** Cecil E. Gregg. **STAFF SERGEANT:** Douglas V. Radney. **SERGEANTS:** Lewis Coburn, Clevis Jones.

AMERICAN VOLUNTEER GROUP DISTINGUISHED FLYING CROSS

For gallantry in action while members of the now disbanded American Volunteer Group in China:

SQUADRON LEADERS: Robert Neale, John Van Kuren Newkirk*, Franklin Rector, Robert James Sandell*. **SQUADRON VICE-LEADERS:** Charles Rankin Bond, David L. Hill, Frank Schiel*. **FLIGHT LEADER:** R. L. Little*.

WHAT YOU SEE WON'T HURT

(Continued from Page 5)

planes have red noses, all Axis aircraft usually have white noses (although they might be yellow, too) and usually white wing tips. If you don't see these tiny objects first you probably won't see anything at all afterwards. But, if you have seen them, the next thing you'll view will be a streak or several streaks looking somewhat like a meteor traveling in the direction of the bombers (if you're acting as escort). Here you point your nose in the path ahead of this object and press the trigger at the same time, always looking behind, however, to make certain that a tiny spot has not suddenly become a very large white or yellow spinner with little flashes coming from it. If you find that the latter has occurred, you can do one of three things. First, and best, is to turn hard; second, to throw your stick and rudder into one corner (any one that suits you, but also hard); and third, if you are too terrified to perform either of these maneuvers, trim the ship in neutral, undo your safety harness and run like mad around the cockpit calling for help on the radio. (In all fairness, I advise the last procedure only in cases of dire necessity, because it doesn't always work so well.)

Anyway, those are the principal sights you'll be seeing, but there are also a few more. For instance, you might see the little meteor disappear straight down and then suddenly find that an aircraft has been catapulted straight up into the air from the ground to the bombers. Another odd, but frequent occurrence is to have the dirty little dart emerge inverted. (His mother was scared by a tree sloth). The 109 functions perfectly upside down and the pilot only has to pull back on the stick to get away.

Don't depend on recognizing enemy aircraft by their crosses or faces alone. Learn the differences between the ME-109s E, F, and G, the FW-190, the Macchi and the others as regards their wing tips, tails, spinners, etc. Aside from the fact that your intelligence officer is always curious as to exactly what you were fighting (and can deduce much interesting information thereby), your No. 1 will dislike you lots if you confuse his tail with that of a 202 or such.

To sum up, first of all remember that you can always recognize the Hun by his position and actions in the sky. He has a more or less set pattern, as was illustrated at the beginning of this piece. In the second place, be able to recognize his plane so that if you should ever get a long enough glance at it you can tell the I.O. what it was. Finally, look before you press the trigger. Your own pursuit pilots usually get a little angry if you fire at them, but the bomber boys get hopping mad and might shoot you down. ☆

PICTURE CREDITS

6-7: Sikorsky Aircraft. 8-9: Wright Field, AAF and Life. 10-11: Lockheed-Vega Aircraft and Hans Groenhof. 34-35: Curtiss-Wright Corp. and Lockheed-Vega Aircraft. All other photographs secured through official Army Air Forces sources.

(Continued from Page 9)

servation for their instruments. Once this conviction is arrived at, there is no cure —it is invariably fatal. An instrument of this type is the Astro-Compass, shown in an accompanying photograph. It is used to try to explain away some of the confusion. Although such attempts at explanation seldom succeed fully, it may be of interest to follow the line of reasoning used.

The Astro-Compass is a simple equatorial telescope mounting, such as is seen in any observatory, in which a split-pupil collimator sight is substituted for the telescope. In principle the Astro-Compass is *exactly similar* to all "arc" reduction methods. Suppose the instrument is levelled and is oriented in azimuth by motion 3 (see illustration). Then, using the time selected for observation, extract the declination of the body to be sighted from the Almanac and set it on the instrument. The sight now can be pointed exactly at the selected body by motions 1 and 2. When the instrument is so sighted latitude can be read from the scale used in conjunction with motion 1 and LHA (and therefore longitude) from the scale used in conjunction with motion 2.

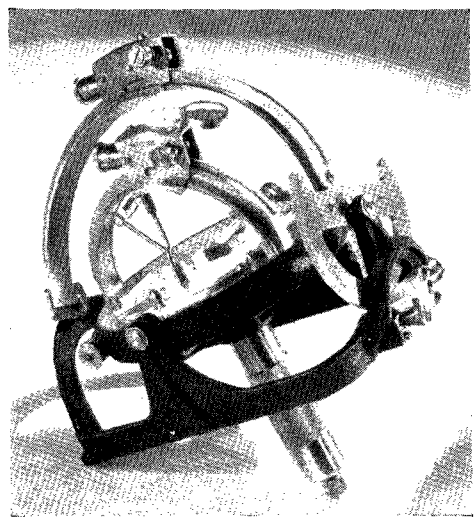
It must be noted carefully that *two* combinations of motions can be used to point the sight of the levelled instrument on any body in the sky. The two independent combinations of motion are 1 and 2, and 1 and 3. A combination of the motions 1, 2 and 3 can accomplish the same result. However, *if one of the three settings is in error, all are in error.* Therefore if the latitude and longitude are to be obtained from the instrument with reasonable and usable accuracy then the azimuth (motion 3) must first be set with reasonable accuracy (*true north* plus or minus 5 minutes of arc). The inability to achieve such accuracy in the azimuth setting is the one and only reason why latitude and longitude cannot be obtained from a single observation.

THE directness of reducing an observation by plotting it directly on a small sphere by means of a great circle "ruler" and a small circle, "compass" has appealed to a few people since time immemorial. These individuals founder on the question of "scale." They will go to great lengths to devise an assortment of micrometer and vernier scales and compasses to achieve the required accuracy when, in the final analysis, the accuracy obtainable is dependent on the visual acuity of the user. This type of instrument is a plotting device, pure and simple, just as is a drafting board, T-square triangle and ruler. The draftsman's accuracy depends not upon an assortment of verniers, micrometers and finely divided scales but upon his visual acuity, the sharpness of his pencil and his skill in using it. Increase the sharpness of his eyesight with a reading glass and his accuracy increases in proportion. The same applies to the "spherical draftsman" whose pencil line is from five to ten miles in width to begin with.

The "arc" and "sphere" machines are very conducive to an assortment of gymnastics when used in the air. Though the inventors of these machines invariably recommend the lap, the user generally winds up his problem with the instrument on a table and himself in a head-stand. Using the instrument in the laboratory and in the air is comparable to writing a letter in a study and in a typhoon. For instruction purposes, a system similar to this one recently was advocated by Yale University. It had been used as far back as 1934 in Air Corps Navigation Schools.

Navigators disagree as to the size of a sphere needed for acceptable accuracy, some claiming that only a five-foot sphere is necessary but others contending that a diameter of fifteen feet should be the minimum.

In spite of the drawbacks of the arc and sphere, they have some ardent supporters. Recently a well-meaning business men's publication levelled a scorching barrage of



AAF Type A-3 Line of Position Computer; too slow for standard use.

vicious invective at the American armed services for not going hook, line and sinker for the twelve-inch sphere of a civilian sportsman pilot. Although the particular device had been put through its tests seven years ago, the Materiel Center had invited the inventor to submit sample articles and cost quotations. Re-examination of a device previously abandoned is sometimes a waste of time and money—but the technicians of the Air Forces Instrument Laboratory constantly search for improvements, regardless of the ability of the inventor.

Other appealing graphical devices suffering from "scale" trouble, include the D'Ocaigne Nomogram and the system of superimposed stereographic projections tangent at the equator. Fortunately, these are the products of astute students of navigation and have been presented not for actual air use but as interesting novelties.

Although it is impossible to revamp the navigation equipment and training of the Army Air Forces overnight, many 1942 developments are rapidly being adopted as standard procedure for combat navigation.

Plotting equipment essentially is of the conventional type of protractors, compasses, parallel rules and a scale adequate for all plotting purposes.

ALTHOUGH there are in existence many computers for the solution of the wind triangle and of speed-time-distance problems, the E-6B dead reckoning computer, which was adopted as standard equipment in 1939, is unquestionably one of the most versatile in the field. This computer has met universal favor among navigators and pilots who are required to perform routine dead reckoning problems.

The several systems and methods used by the Air Forces for the reduction of celestial observations are the Astrograph (adopted in 1942), the Star Altitude Curves (1937) and Hydrographic Office Publication 218 (1942), 214 (1937) and 211.

The Astrograph and the Star Altitude Curves are systems similar in principle. The advantages of speed and simplicity favor the Astrograph although the Star Altitude Curves have slight accuracy advantages.

Hydrographic Office Publications 218 and 214 are alike in principle and in accuracy. Since 218 is considerably faster and offers less chance to err because of its superior arrangement, it will completely replace 214. The Astrograph also will replace the Star Altitude Curves in Air Force navigation.

Hydrograph Office Publication 211 is retained for polar work, above latitudes of seventy degrees.

As a goal for inventors who are striving to improve the navigation systems of the Army Air Forces, the respective accuracies and times required for reduction of a two star fix in the several Air Force systems are as follows:

	Accuracy	*Time of Reduction*
Astrograph	±2 miles	1.5 min.
Star Curves	±1.5 miles	2.0 min.
HO 218	±0.5 mile	4.0 min.
HO 214	±0.5 mile	5.0 min.
HO 211	±0.5 mile	10.0 min.

The time required by mechanical devices for the reduction of a two body fix generally approximates ten minutes with an accuracy margin of from five to fifty miles.

Navigation systems, the same as airplane designs, are compromises. The devices and methods adopted by the Air Forces represent a compromise between accuracy and speed of reduction. Still, this compromise has not yet been matched by any of the hundreds of mechanical devices submitted.

Despite the unequalled practicability of the Air Force systems now in use, Wright Field continues to examine new devices and methods proposed by navigators and non-navigators, constantly striving to be of more assistance to the combat navigator who often must be a gunner, a radio man, a bombardier, or a co-pilot, in addition to his other duties.

Planes occasionally are lost by the human error of the navigator. Wright Field's objective is to develop devices and methods that will eliminate all possibility of human error. ☆

Technique

TWO NEW WARPLANES

Shown above during a test flight is the new Curtiss A-25 dive bomber. Christened the Helldiver, after its Navy counterpart, the A-25 has greater speed, range and striking power than any dive bomber now in action. The plane is already in production at Curtiss-Wright's Missouri factory.

TWO NEW Army Air Forces planes have been announced: the Lockheed C-69, a four-engined high altitude transport, and the Curtiss A-25, an Army version of the Navy's famed Helldiver, recently voted the "world's best dive bomber" by British aviation experts.

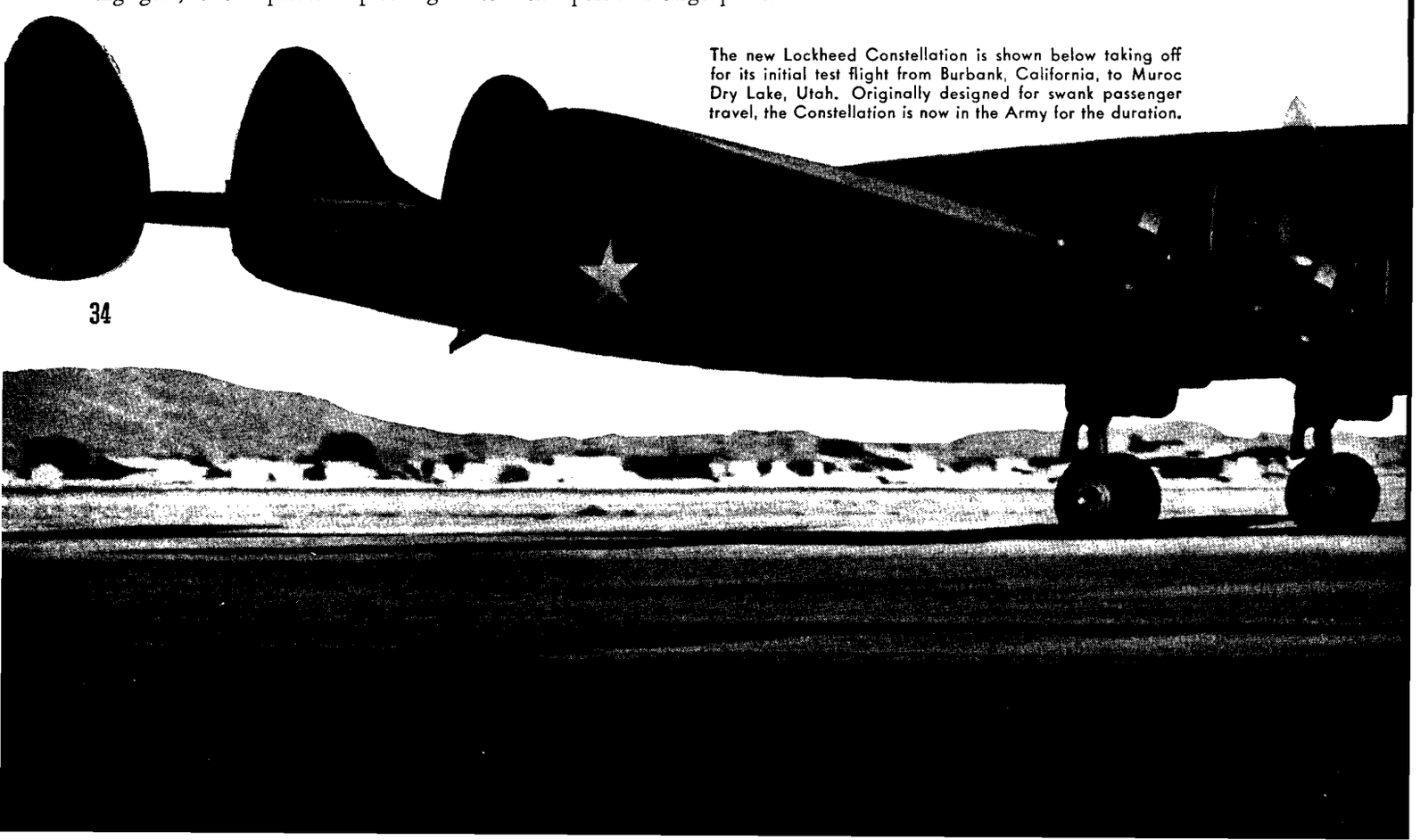
The C-69, named the Constellation, is a big, long-range speedy airliner with a pressurized cabin for high-altitude flying. It is capable of carrying 55 passengers and a crew of nine from coast to coast in less than nine hours, or of flying a light tank and a complement of troops across the Pacific to Honolulu in twelve. Although one of the largest airplanes in the world, it uses but one gallon of gasoline per mile when fully loaded.

The new transport is powered by four Wright Cyclone 18-cylinder engines, of 2,000 horsepower each. It has tricycle landing gear, two separate superchargers to keep the sealed cabin comfortable at all altitudes, hot-wing de-icing and new-design streamlined nacelles that avoid compressibility shocks on the nose cowl.

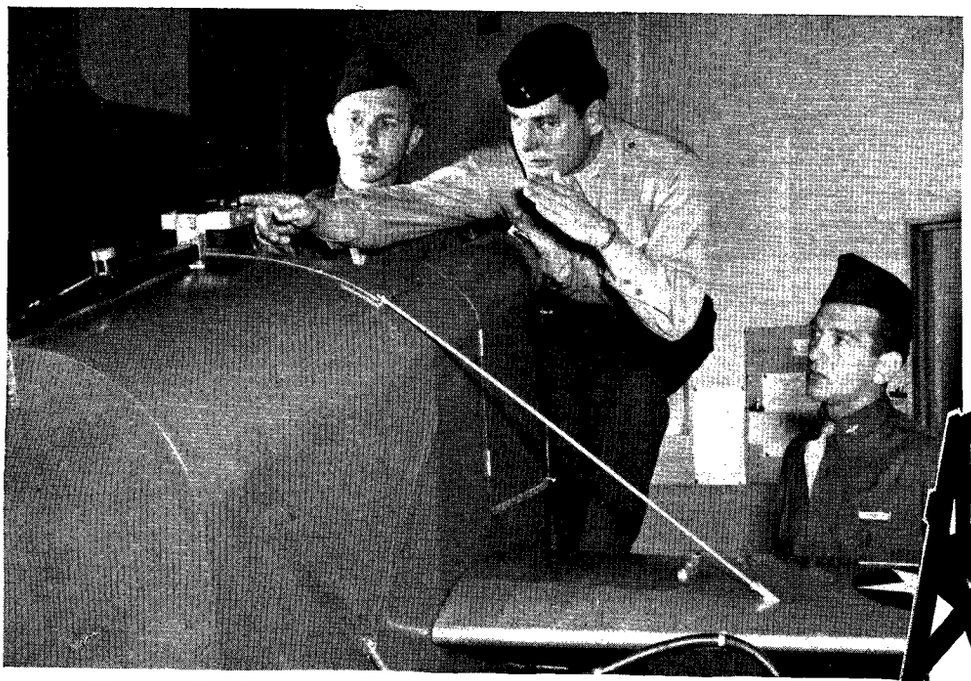
A distinguishing feature of the C-69 is its three vertical tail fins. These aid the pilot in controlling the plane at high speeds and enable it to fit in ordinary sized hangars. Each engine is an independent power source and can be completely replaced in 45 minutes. The wings are similar in design to those of the Lockheed P-38. The Air Forces will use the C-69 as both a troop transport and cargo plane.

The A-25 is a two-place, mid-wing dive bomber powered with a 1700 horsepower Wright Cyclone engine and equipped with a Curtiss electric propeller and retractable landing gear. The first A-25 was test flown sometime ago. It was presented formally to the Army at a special ceremony in the Curtiss Missouri plant, where Helldivers roll off a four-block-long assembly line.

The Army Helldiver design is very similar to the Navy design, and, with minor changes that can be made in the field, the planes can be used interchangeably by both services.



The new Lockheed Constellation is shown below taking off for its initial test flight from Burbank, California, to Muroc Dry Lake, Utah. Originally designed for swank passenger travel, the Constellation is now in the Army for the duration.



Lieutenant Paul Greene exhibits the fine points of aerial gunnery on a gun-equipped Link trainer.

Two New Gunnery Training Techniques

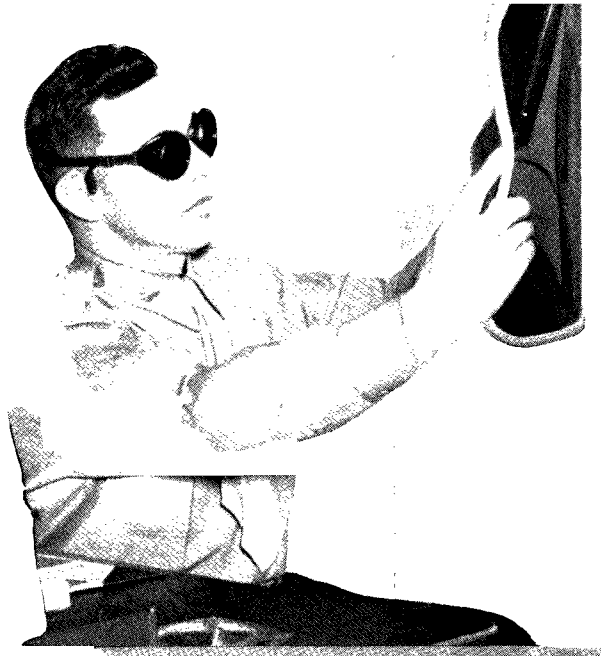
ALMOST every month the ingenuity of Air Force officers results in further aids to gunnery training. Two of the latest are at Foster Field, Texas: a skeet tower and a special BB gun mount for link trainers.

The purpose of the tower is to prepare prospective gunners for the many angles of fire they will encounter in modern bomber turrets. From platforms of ten, twenty and thirty feet students learn how to shoot down, as well as up, at fast-moving targets.

The BB gun mount uses to advantage the maneuverable cockpit frame of the link trainer. With it cadets learn to "lead" moving targets that are speeding around a circular track, thus acquiring firing practice without leaving the ground. The device is unusually valuable because it can realistically simulate aerial gunnery effects.

—*Captain Malcolm B. Allen, Foster Field.*

(Continued)



New Flying "Hood" A Safety Factor

Turner Field, Georgia, has accomplished a revolution in the field of blind flying hoods.

Old-style hoods were made of heavy, black cloth. In side-by-side, multi-engine trainers such as those used at Turner, this had many disadvantages. The student, completely encased in the hood around the pilot's seat, could not see his instructor (in the co-pilot's seat) or the engine instruments on the instructor's side of the cockpit. The instructor, on the other hand, could not see his student or the flight instruments, and had no visibility out the left side of the plane.

Not only were these limitations inconvenient, they were dangerous in the busy air around a large training center such as Turner Field.

So tests were begun to locate a substitute for the ordinary black-cloth hood. One was found. It is a ruby acetate filter that can be placed on windshields. When viewed through a pair of blue-green optical goggles this filter presents a solid black appearance, but when viewed with the naked eye it is perfectly transparent.

The results are excellent. With the new system the student wears goggles and the instructor does not. This gives the student an excellent view of all the instruments, the interior of the plane and the instructor, but prevents him from seeing outside the cockpit. The instructor, on the other hand, has a full view of outside traffic in addition to being able to watch the student and his handling of the flight instruments.

The use of the new filter and goggles has been so successful that 95 percent of all training planes at Turner are equipped with them.

Mobile Flood-Light

An inexpensive but highly-efficient mobile floodlighting unit for auxiliary fields has been designed and constructed at Mather Field, California, by twenty-year-old Technical Sergeant James L. Hancock, working in conjunction with First Lieutenant Clyde C. Cramer of the Post Operations Office.

The new unit, which can be used as a substitute for both the regular J-3 and portable B-3A floodlighting systems, consists of a five-kilowatt motor generator mounted on a one-ton, two-wheel cargo trailer. A framework of two-by-six timbers on the rear end supports four light heads from the B-3A portable light. This frame may be tilted forward or backward to obtain different angles of field illumination, and the entire unit may be swung in a horizontal arc on the trailer wheels.

The picture above shows how Waco Flying School's portable control tower can be operated on auxiliary landing areas. It generates its own power, thus eliminating outside attachments, and can be transported by jeep.

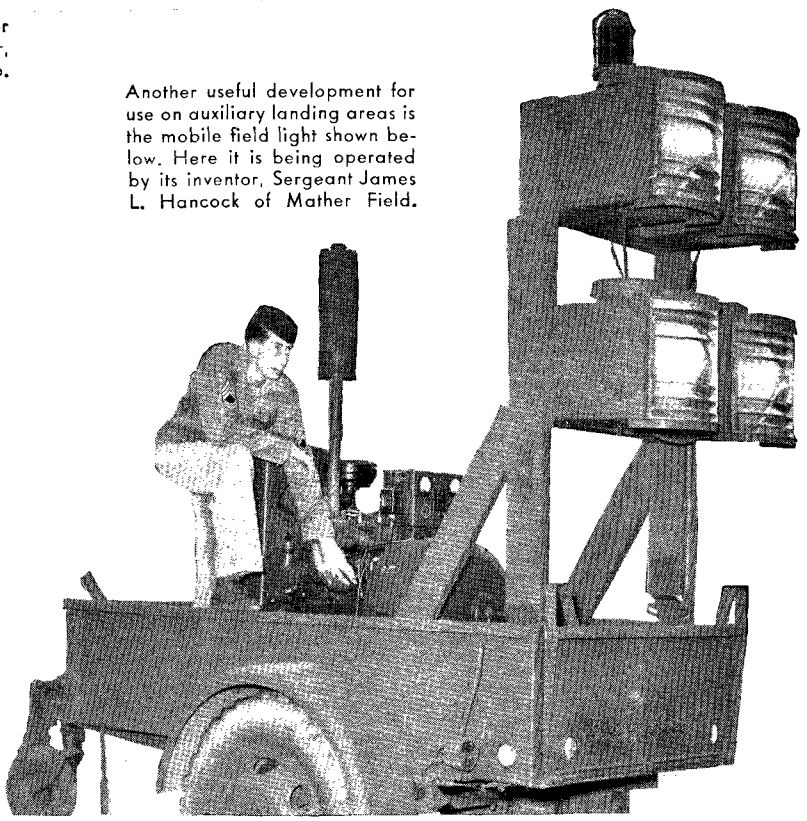
Portable Control Tower

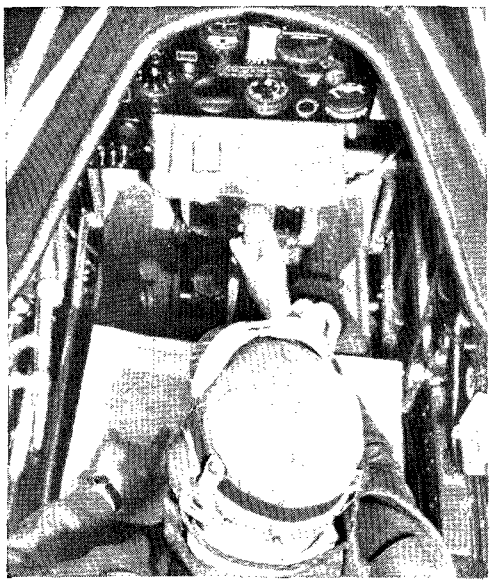
A mobile control unit, to do the job at auxiliary airfields that control towers normally do at completely-equipped bases, has been developed and put into operation at the Waco Army Flying School, Texas, by Technical Sergeant John T. Skinner.

Before the development of Sergeant Skinner's device "control planes" stationed on the ground had been used as control towers during night flying to transmit and receive messages from cadets in the ships aloft. After hours of radio work, batteries on these control planes often ran down so badly they wouldn't turn over the planes' engines. When this happened a spare battery — and a crew to install it — had to be brought from the home base, often miles away, before the "mekiwi" could be put back into commission.

The new mobile control board has ended all this. Now a complete communications system is brought right to the auxiliary field before operations start. It is transported on a jeep, can be dismounted by one man and placed in service anywhere within a matter of seconds. The complete equipment, plus a service battery and a spare, is mounted on a two-wheel chassis that can be easily moved about. No outside attachments are necessary.

Another useful development for use on auxiliary landing areas is the mobile field light shown below. Here it is being operated by its inventor, Sergeant James L. Hancock of Mather Field.





THERE IS MUCH MORE to the technique of flying than just knowing how to operate an airplane, as aviation cadets soon find out. For one thing, the finished pilot must know how to find his destination. The Randolph Field cadet above learns this all-important technique with the aid of a compass, a speedometer, a watch and a map. The compass tells him his direction, the speedometer tells him his speed, the watch tells him how long it should take him to reach his objective at a given speed, and the map provides him with check points to measure his progress.

One More Hoist

ANOTHER portable boom hoist for use with two and one-half ton government trucks, similar to that described in the January issue of AIR FORCE, was independently designed and built in the spring of 1941 at another Air Forces installation, according to information furnished by Colonel P. E. Ruestow of the Directorate of Base Services in Washington, and Colonel J. M. McCulloch, Assistant Commandant of the Air Service Command Base at Orlando, Florida.

Designer of the hoist was Captain E. D. Grana, then a master sergeant and foreman of the base engineering shops at Mitchel Field, New York.

Captain Grana's hoist was first used during the summer and fall of 1941. It received much favorable comment at that time because of its ability to perform most of the work of the standard Air Force wrecking truck, and because it could cross extremely light bridges that would not support the comparatively heavy weight of the standard wrecker.

Since then the boom has been used extensively by the 91st Service Group, and has accompanied several contingents of the Army Air Forces to Iceland. Recently it has been put into use by the 25th Service Group.

OBSERVATIONS

(Continued from Page 17)

moving through cloud banks and overcast toward this destination. Red anti-aircraft batteries nearest the front were charging a modest price for admission.

At the farthest point of our own advance we were stationed with the division that had effected the junction between the north and south Red forces and had then wheeled eastward to hammer at the entrapped Axis forces.

Veterans of fifteen months of steady fighting, for twelve days and nights in the forefront of this offensive, this division typified the best that could have been found in any army. Their morale was high. The men were getting two hot meals daily and a third hot or cold.

On the crests looking toward enemy positions they had dug a new line of trenches, deep and heated with open fires.

Their commander, a bullet-chested Georgian only 34 years old, had just been decorated and made a Major General. The division had been designated a Guard Division for its outstanding achievements. The staff averaged under 30 and their reception to General Hurley was on a most friendly and cooperative man-to-man basis. They were proud of their handiwork and eager to display its every detail to us.

In the path of this army that had carried the brunt of the offensive southward and eastward we found all the vestiges of violent conflict, of death with suffering, of defeat and victory.

Numerous trophy dumps were piled high with rifles, bayonets, boots, helmets. Dispersed in parks were captured artillery pieces, much of it modern Axis-made ordnance, tanks and tank destroyers. At two captured airfields were wrecks of some 60 Axis planes—Focke-Wulfs, Heinkels, Junkers and an occasional Messerschmitt.

At one of the fields, everything had been caught on the ground by a dawn attack of Red infantry, tanks and light artillery. Nearly a dozen of the enemy planes were taken undamaged, we were told, and a major of the Red Air Corps, wearing the insignia of a Hero of the Soviet Union, described with evident pleasure how he had flown one of the Focke-Wulfs over Rumanian positions for reconnaissance.

A great air battle evidently had taken place above the second field and for miles around were scattered the remains of fighters, most of them marked with the swastika.

Already in operation under Russian hands were dozens of sturdy Axis trucks, most of them almost new. Also salvaged were numerous mobile machine shops, ambulances and radio trucks.

During the second half of our reconnaissance—that, on the Caucasian front—testimony to the effectiveness of the Soviet's defending air strength was given us willingly by a half-dozen young Axis air force officers in a prison camp up the Caucasus valley. ☆

Like the men it serves, AIR FORCE, the official service journal of the Army Air Forces, has many places to go.

Because of the limited number printed monthly, we need your cooperation in getting each copy to as many readers as possible at your station.

Pass this copy of AIR FORCE on to the other men in your unit as soon as you've read it. You'll be helping us to get the service journal to all the men of the Army Air Forces—all over the world.

DAWN OF A NEW ERA

(Continued from Page 7)

difference—only 45 true ground speed. At this point I began to worry about the oil temperature. The day was hot and getting hotter, and the oil had been slowly warming up until it approached the danger zone. It passed 80 degrees (centigrade) and crept on up toward 85. I didn't like it, and I watched it so closely that it didn't occur to me until afterward that I was at that moment setting some sort of an unofficial record—flying a helicopter across a State boundary for the first time.

As Brewster drifted slowly by, I began to edge southward, because straight ahead, as far as my eye could see from 2,500 feet, there was an unbroken stretch of forest. The highway to the south at least offered promise of speedy assistance in case of trouble, so its winding ribbon became my temporary beacon.

The open fields of the Hudson Valley caught my shadow like a giant whirling spider far below. I began to drop down for the scheduled landing at New Hackensack, just outside Poughkeepsie. I was 35 minutes late, and it was pleasant to see George Lubben's shock of red hair come bounding from the hangar as I hove in sight. George was at this first stop to give the ship a thorough going over. As I came in range of the field he was talking by phone with the ground party who had gotten as far as Brewster and called to check progress.

On this first leg, besides crossing the State line, another record had been set, but not recorded so no official claim can be made for it: the national airline distance record for this type of craft was unofficially established at fifty miles (since no other helicopter in the Western Hemisphere had flown any appreciable distance before). We might also have claimed speed and altitude records, although three weeks earlier I had gone 82 miles an hour and climbed to 5,000 feet in this same ship.

OFF FROM New Hackensack, I swung north toward Albany, flying about 1,000 feet above the valley floor. As I circled Albany airport, I elected to land at the end of the line of parked airplanes with the nose of the ship practically against the fence—something no other aircraft would ever consider doing. Everyone rushed from the buildings, expecting me to pile up among the automobiles in the parking lot. But the landing was made (as they always were) without incident. As I walked toward the hangars, someone in the crowd grinned, "What are you trying to do—scare the hell out of us?"

Another airline distance record on this leg—78 miles.

From Albany to Utica was uneventful except for the pleasure of flying safely up the Mohawk Valley with the hills on either side often higher than the ship. I felt like the Wright brothers, looking down from my transparent perch above the house-tops.

Farm-yards full of chickens and animals would suddenly become uninhabited as shelter was sought from this strange hawk—but the yards would quickly fill again as houses and barns ejected groups of human beings gaping skyward.

At Utica I drifted up sideways in front of the hangar and hung there stationary for a minute or so while mouths opened wide enough to land in. Then I slid over to the ramp and squatted down. The guard greeted me as I walked up to the office: "I don't believe what I saw just now. Of course, I realize this is a secret ship, but do you mind if I look again when you take off?"

World's endurance record for helicopters exceeded on this leg: 1 hour, 55 minutes (20 minutes longer than the existing record held by Mr. Sikorsky). Also, another four miles added to my previous airline distance record, bringing it to 82 miles.

Flight Summary

Five days; 761 airline miles; 16 separate flights; 16 hours, 10 minutes elapsed time; four States covered; first helicopter delivery flight completed; unofficial American airline distance record repeatedly established and exceeded, finally to remain at ninety-two airline miles; first interstate helicopter flights (unofficial); first interstate helicopter passenger flights (also unofficial); world endurance record for helicopters exceeded with the flight of one hour, fifty minutes (most regretfully unofficial).

It was a beautiful flight from Utica to Syracuse, marred only by my constant concern over the mounting oil temperature which now pushed close to 95 degrees. The sun was getting low in the west, the air was smooth, and a gentle tail wind puffed me on my way. I was fifteen minutes ahead of schedule as I came into the Syracuse airport and hovered in front of the hangar where I thought we were going to house the ship. Suddenly a guard burst around the corner to direct me where to go. He stopped and spread his eyes, his jaws and his feet simultaneously when he saw me awaiting instructions fifteen feet up in the air. Recovered from his shock and reassured by my grin, he signalled me down to the other end of the field, and then dog-trotted along the ramp with the helicopter's nose a few feet behind and above him.

This first day had gone on schedule. The helicopter had proved itself an airworthy vehicle, capable of rendering true transportation. It had travelled 260 miles in five hours and ten minutes without even beginning to approach its high speed. But a quick inspection of the ship at Syracuse revealed one difficulty in this particular craft that was to give us our share of worry in the weeks to come. The transmission was heating up badly. It seemed strange that we should create a totally novel aircraft and run into no particular structural, functional or control problems—whereas a simple gear transmission, something that had been developed and used successfully in millions of applications during the last half century, was destined to hound our every move.

Off for Rochester the following morning, I kept the ground party and their yellow-spotted car in sight for several miles, but finally decided to cruise ahead at normal speed. It was a beautiful day, but the hot, calm air presaged thunderstorms. At the outskirts of Rochester, I noted that the main highway went straight ahead into the business district, while a small cross-road to the left led to the airport a few miles away. I lingered above the crossing, debating whether or not to hover there until our car came along and signal them the best route to take, but finally decided that in the interests of the over-heating transmission it would be best to go on to the port and check things over.

Above the field, I headed into the wind and slowly settled down facing the open hangar doors. Several men working inside ran for their lives, expecting a crash, but when they began to see that there was no danger they reappeared from behind airplane wings and packing boxes and watched the landing with unconcealed amazement. A guard came over and advised me to taxi up in front of the control tower at the other end of the hangar line. He didn't realize that in this strange craft a short flight was much more satisfactory than taxiing on the ground. His eyes popped open as I took off, still facing the hangar only a couple of hundred feet away, and buzzed along lazily, ten feet above the ramp and four feet above his own head.

The control tower was simply a square glassed-in box atop a fifty-foot skeleton tower out near the operations area. No ship may land without first receiving a green light signal from the control tower operator. It was fortunate indeed for me that my ship could hang motionless in the air, because when I whirred up in front of the tower and looked the operator in the face he was so astounded that he left me hovering there for the better part of a minute before he stopped rubbing his eyes. Then, with a broad grin, he flashed on the green light.

The transmission was still running pretty hot, so I decided to fly to Buffalo with the metal cowling removed from the sides of the ship for more air circulation. Off again, with a headwind and a promise of thunderstorms, I stuck close to the ground party so that if an intermediate landing was required they would be able to check the gear case a few minutes after landing.

Down the highway we went together. I knew they were pushing along at good speed (they said later that it was often close to seventy-five) and I was hoping a State trooper would pull them over; it would have been fun to hover a few feet above them while he was bawling them out or giving them a ticket. No trooper showed up, however, so I had to content myself with flitting

ahead to each cross-road to make sure there was no converging traffic to cause danger—then signalling them to proceed without worry at the intersection.

As we approached Batavia, the sky to the west became darker, and an occasional streak of lightning sliced down through the black curtain a few miles away. I edged northerly for a time to see if I could get around the storm, but it was spreading out and cutting off my path. It looked pretty good to the south but I hesitated to get too far off course, particularly since I didn't know what sort of conditions prevailed behind the storm front. I finally decided to land and sit it out.

The car with its yellow dot had gotten itself misplaced somewhere in Batavia's traffic and I wasn't sure which of two parallel roads it would follow toward Buffalo. So I leisurely swung back and forth between the two roads, trying to spot my companions, keeping a weather-eye on the progress of the storm in the meantime, and picking out a likely-looking house with a telephone (I could see the lead-in lines from the road) where I could land and report my position. (With this aircraft the size of the available landing field or its surface conditions had no influence on where to land, the only factors being a comfortable house and a telephone.)

I failed to pick up the yellow dot on the highway. (They claimed I flew directly over them several times), and after five or ten minutes the storm was getting too close for comfort. I swung in, then, slowly over the predetermined spot—a nice green strip of grass about 75 feet wide between two ploughed gardens—near an old farm house.

As I came to a stop 25 feet above the green turf, the lack of power which was this particular craft's weak point became all too apparent. The "bottom" seemed to drop out of it, and in spite of all I could do the ship settled rapidly to earth. Future ships will have an excess of power to cope with such unfavorable conditions as the calm, humid air before a thunderstorm, but I spent a few uncomfortable seconds wondering about the safety of this experimental baby. (Bear in mind that the pilot's safety was never in jeopardy, because of the ship's unique ability to fly as slowly as desired and to land vertically in any small spot.) A quick check of the ship showed it to be unscathed by its experience. The occupants of the houses appeared relieved to see signs of human life around the aircraft. They were only too glad to let me use their phone.

When the weather cleared and I was preparing to leave again, one of the farmers warned me quite persistently of a hidden ditch about 200 feet from the ship. I couldn't make him believe that I would take off straight up, so I finally quieted his fears by assuring him, with thanks, that I would be careful.

Another storm was skirted before Buffalo, but finally the airport loomed out of the haze. An airliner was about to land as I approached the control tower, and the man in the tower could not be expected to guess that this queer contrivance would not interfere in the slightest with the airliner's landing—so he gave me the red light. A short circle of the hangars brought me back over the tower a second time, and, although the airliner was already on the runway, the tower-man realized I saw him so he flashed a green signal for landing and left it up to me. I settled in slowly over the hangars while a sea of faces gaped upward. I purposely over-shot the edge of the ramp by twenty feet—and then backed up onto it. The ground party, on hand for the landing, drifted through the crowd and heard:

"I never thought I'd live to see one back up!"

DUE TO a long string of thunderstorms between Buffalo and Cleveland, further flights were cancelled for the day and arrangements were made to store the ship, with armed guards standing by all night.

Next day the usual weather prevailed in the pocket below Buffalo—very smoky, hazy conditions cut visibility to less than a mile for a time—but I steered my course half by compass and half by highway because I wanted to be near the road that the ground party was following.

Once, as a towering radio mast loomed out of the murk, I became impressed with the value of an aircraft that could come to a complete stop in mid-air if necessary.

The lake shore finally came in view, and I followed it without incident to the government's intermediate field at Dunkirk. The field was still wet from the storms the night before, and the attendant was dumbfounded when I hovered about until I found a high spot near the building where there were no puddles to step into.

The transmission was no better and no worse than before, and I decided I could take one of the ground party on the next flight. A flip of the coin chose Ralph Alex, and we were soon on our way to Erie. The clouds were still quite low and nasty looking. In any other aircraft I would have been uncomfortable.

It was on this flight, in the middle of a driving rainstorm, that a helicopter passenger was carried for the first time across a State line.

Erie at last. We hovered for a while in front of the hangar before landing—but we missed the best opportunity of the trip. One of Ralph's pet tricks was to jump out of the ship while it hung a few feet off the ground. Why didn't we think to have him do it here, and then inquire the way to the gas pump? As it was, we landed and I sidled over to the pump later.

Weather forecasts were bad. The high winds, upward of thirty to thirty-five miles per hour, we were not yet prepared to face, particularly if they were headwinds as promised. So we stowed away at Erie for the night.

The next day, we took off in the face of a twenty to twenty-five mile wind, because the forecast showed the probability of worse weather to come, and we had a good chance of avoiding it if we got on to Cleveland.

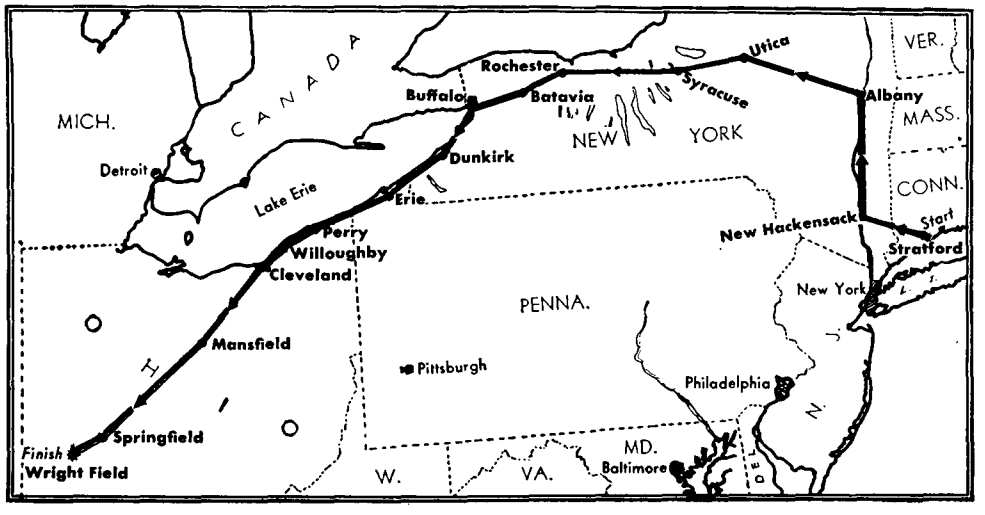
A few minutes out of Erie I realized that the transmission didn't sound the way it should, and, furthermore, I occasionally could feel through the rudder pedals a kind of catching as though small particles of matter were getting caught in the gear teeth. After a few minutes, it seemed the best policy to land and confer with the ground party.

When the ground party arrived, it was decided that Bob Labensky would make a short flight with me, and we would continue along the road until he had a chance to analyze the trouble. If it was serious, we would land again—if not, we would proceed to our next scheduled stop, Perry, Ohio.

Poor Bob. He was convinced the flight would be short, so he didn't bother to get the extra seat cushion out of the car. For one hour and twenty-five minutes he sat cramped up on a hard metal seat with the circulation cut off from both legs.

During this whole flight four ears were cocked for untoward noises—and none appeared. Analysis some time later led us to believe that the extra passenger weight was sufficient to change the loading on the transmission so that it performed satisfactorily. Actually, however, it was slowly chewing itself to pieces and had to be replaced shortly after arrival at Dayton.

This was the roughest leg of the entire trip. The wind was gusty, varying from twelve to twenty-nine miles an hour. It was



dead ahead, so I chose to fly close to the ground in order not to get into the stronger winds at higher altitudes which would slow us down considerably more. But close to the ground we got the full value of all ground "bumps." Whenever I would see a ravine ahead I would brace myself for the turbulence that was sure to be over it. Every patch of woods had its own air currents; and to the leeward of a town or village the air was extremely choppy.

Many times we would lose 75 to 100 feet of altitude in a down-gust--and we were only 300 feet above the ground most of the time. Once I watched the altimeter drop 180 of those precious 300 feet—and toward the end of the drop I began veering toward an open field, just in case it didn't stop.

But the ship behaved beautifully. It didn't pound and pitch. All it did was float up and down, and get kicked around sideways. There were no sudden shocks, and even when it yawed to one side or the other, it was not necessary to use rudder to straighten it out. Given a few seconds, it would come back by itself.

About the time Bob began to search his limbs for signs of gangrene, Perry airport came in sight, and a couple of minutes later he crumpled out of the ship, for all the world like a new-born calf just trying its legs for the first time.

No gas at Perry, but we still had enough in the tank to get to the small private field at Willoughby. One fellow said that when he saw the ship coming in, he dashed to get a movie camera from his car--but when he noticed the Army star on the fuselage, he promptly changed his mind. Such was the spirit of the flight.

Off on the last leg to Cleveland. Although the weather was a little better, this was a difficult section because I didn't want to fly over congested areas quite yet. A long sweeping circuit to the south carried me over the outskirts, but I had to use caution to keep from getting stuck in a bottle-neck of houses. Only once did I have a few uneasy moments when I had to follow a dual highway between two close-packed communities, where a forced landing, even on the highway might involve in trees and telephone wires.

But at last the Cleveland airport loomed ahead. Somewhere down there Mr. Sikorsky would be waiting. An airliner preceded me into the field, and I realized when I saw the green light from the control tower that they expected me to follow him in and land on the runway. But that was not the way of this craft; if I had landed out in the middle of the field, I would have had to take off again to get in to the hangars. My procedure was to fly down the hangar line until I discovered the one where storage had been arranged, and then land on the ramp in front of it.

As I meandered along in front of the hangars, fifty feet in the air, the green light still followed me. I could almost hear the fellow in the tower saying, "Get that- - - thing down!" He held the light until I got close to the tower, then finally gave up. I hovered momentarily out in front of him, grinning to see what he would do. He was scratching his head- -reached for the light again — thought better of it - - and finally with both hands signalled me vigorously "down."

I laughed and continued my perambulations. In front of one hangar there appeared to be more commotion than usual, so I headed that way. There was our crowd —Plenefisch and Walsh, the hangar crew— and there, apart from the rest, stood Mr. Sikorsky. He waved happily, and beamed with a broad, almost childish smile. A space had been cleared between the ships parked on the ramp, and I settled easily into it.

The weatherman hadn't been very hopeful about the weather from Cleveland to Dayton, but it turned out to be a beautiful, warm Sunday morning with a gentle breeze and high puffs of clouds.

Mr. Sikorsky was to join me on the flight from Cleveland to Mansfield. We didn't want to have him repeat Bob's discomfort of the previous day, so we gave him a cushion.

After the take-off we hovered for a minute or two in front of the hangar, then turned and started south while the ground party in the car was still getting under way. When we were set on the course, I turned the controls over to Mr. Sikorsky.

It seemed strange for me to be telling Mr. Sikorsky anything about flying a helicopter, since he had made all the early flights with the original experimental model, and as a matter of fact, had taught me to fly it. The answer, of course, was that he had been too busy to spend much time at the controls of this later model.

He had only handled them for two or three minutes during one flight at the plant, but he quickly caught the feel of it—and from there to Mansfield I was simply the navigator.

Since he had never landed this ship, he handed the controls back to me as we approached Mansfield airport. We landed close to the other ships and he stepped out.

After a moment, he walked back to me. "Les, how are you going to get the ship over to the gas pump?" I looked at the solid line of airplanes deployed between our craft and the pump.

"Well," I said, "if you will ask them to have someone hold the wings of the other ships, I'll fly over."

The clear space around the pump was about 75 feet square, and a quick jump was all that was necessary.

I took off alone for Springfield. It was the longest flight of the trip, 92 miles airline. The day was quite warm, and we were still not too sure of what was going on inside the transmission so we thought it best to have the ship as light as possible.

The miles slipped by uneventfully, and in due course the Springfield airport was below me. A small training ship had just landed as I came in over the edge of the field, and he began to taxi toward the hangar at the far end, unaware of my presence. So I slowed down and kept just behind him about five feet high as he bounced slowly along. When he reached the ramp, he turned to line up with the other ships and I saw him suddenly slam on his brakes and stop dead in his tracks.

While I waited for the ground party, an Army ship circled the port. It brought Lieutenant Colonel H. F. Gregory (now Colonel), who deserves more credit than anyone else outside our own small group for the creation of this craft.

The side cowlings which had been removed from around the gear case to give better cooling on the trip were buttoned on for the dress parade to Wright Field. Colonel Gregory phoned that we would be in at 3:40. The engine was started, and Mr. Sikorsky again took his seat alongside me.

Off we hopped, with Colonel Gregory not far behind in the Army ship, and Bob Labensky just behind him in a ship hurriedly chartered at the airport (for which the pilot wouldn't accept compensation).

In fifteen minutes Patterson Field was below us, and as we looked over the top of a low hill, Wright Field came into view.

"There it is, Les," shouted Mr. Sikorsky. His face twitched just a little and we exchanged another warm handshake.

A couple of minutes later we were circling the buildings. I couldn't resist the temptation to zoom low over the ramp, just to show that we had arrived. Then we circled back and hovered in the space that had been cleared for us a few feet in front of the operations office. Mr. Sikorsky waved joyfully to the sizeable welcoming group that had gathered.

The landing was made on a red-topped gasoline pit surrounded by airplanes of every description, from the mammoth B-19 bomber to the tiny little private airplanes that were being considered for various military missions, and Mr. Sikorsky stepped out, proud and happy at the successful completion of an epochal mission. ☆

ANSWERS

to Quiz on Page 26

1. (a) 570 miles
2. (c) Two inline air-cooled engines
3. (d) Intense cold front accompanied by storms
4. (a) Gear up and no flaps
5. (c) Phoenix, Arizona
6. (c) Lieutenant Colonel
7. (c) Revolutions-per-minute of the engine
8. (a) Wellington
9. (c) Two seat, two engine fighter
10. (a) Photographic plane
11. (b) False
12. (b) False. Casablanca is in French Morocco
13. (c) Fireworks
14. (c) "Remember Pearl Harbor" from "Remember the Maine"
15. (a) One degree of longitude.
16. (c) $100 for officers; $50 for enlisted men
17. (a) To fly low over the field
18. (c) Marauder
19. (a) QQZ
20. (b) 2,000 pounds

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GET IN SHAPE - STAY I SHAPE !

DANGER!
BE CAREFUL WHAT YOU SAY!
BE CAREFUL TO WHOM YOU SAY IT!
THINK BEFORE YOU TALK!
GHI
DEF
JKL
MNO
PRS
TUV
WXY
ARMY AIR BASE
STA-6